Design Engineering

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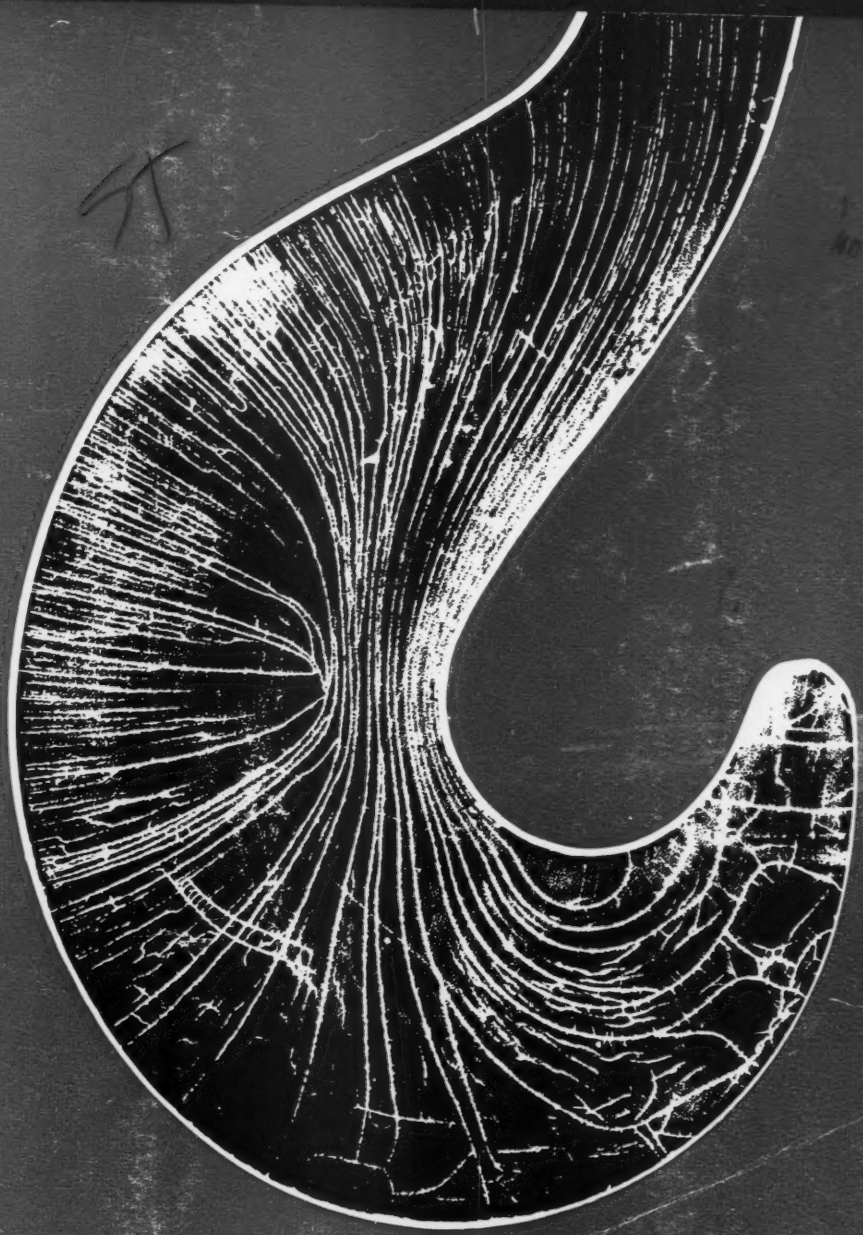
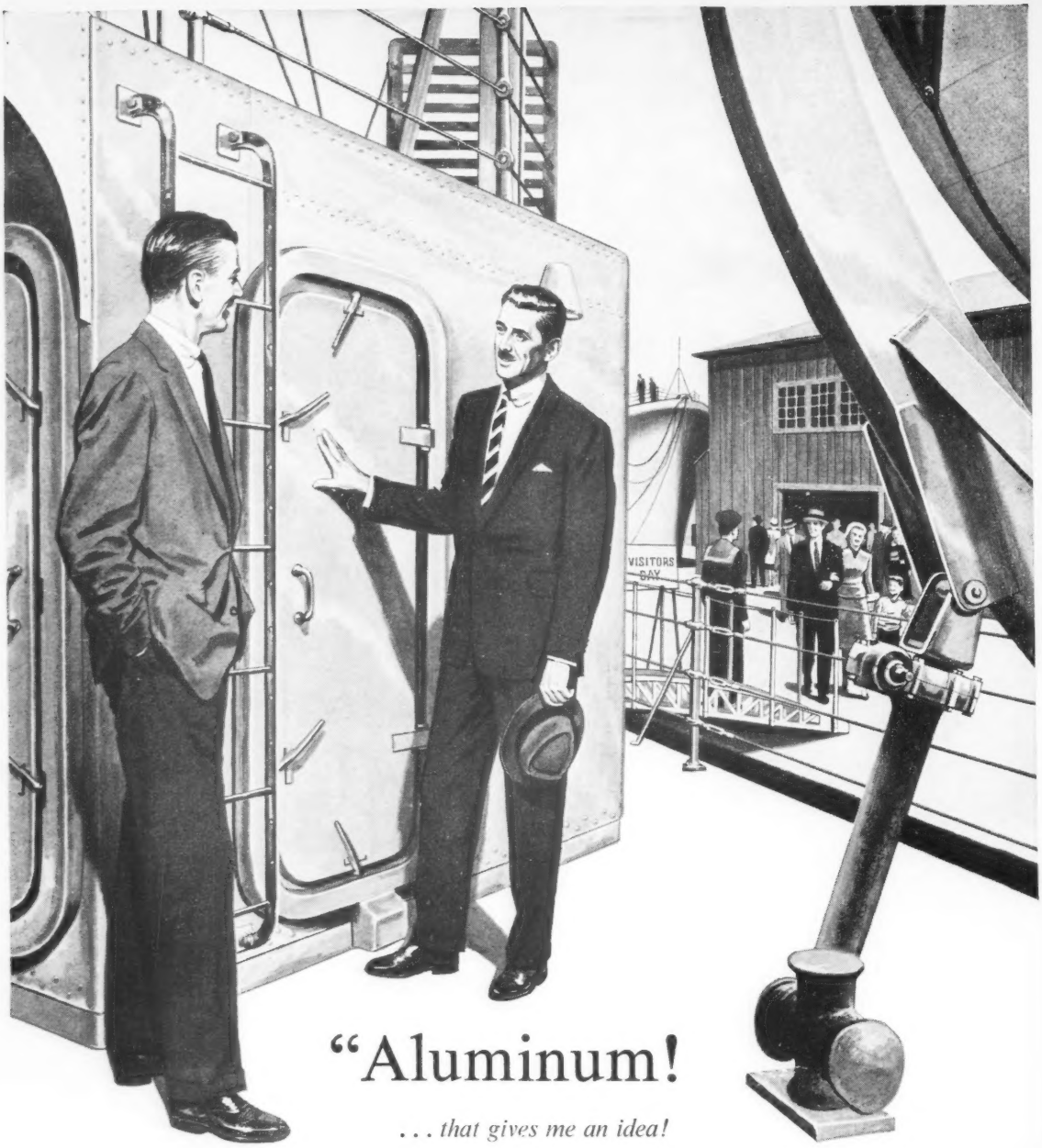


November 1958

Stresscoat 59
Foundry case-histories 48
Gate valve redesign 54

PUBLISHED BY THE MACLEAN-HUNTER PUBLISHING COMPANY LIMITED, TORONTO, CANADA



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Aluminum is showing up everywhere these days. The Navy, for example, chose it for the superstructures of their new destroyer escorts. Its lightness reduces topside weight; its corrosion-resistance reduces maintenance. The ever widening use of this versatile metal has been made possible by the development of new alloys, improved fabricating and welding techniques, consumer demand and ALCAN "know how".

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ALCAN are the people to see about everything concerning aluminum. They are leaders in its development and set its standards of quality. ALCAN has over fifty years' experience in aluminum and is the major source in Canada for sheet, wire, rod, bar, foil, extrusions, castings and ingot.

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ALCAN

NOVEMBER 1958

Vol. 4 No. 11

This month's cover

Concocted by the editor, the illustration on this month's cover shows crack patterns on a steel crane hook. Dye etchant was used to make the patterns better seen.

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Design Engineering

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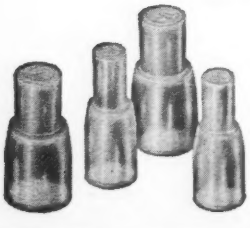
The best-dressed Pigtails are wearing

BURCAPs

THE COMPRESSION–INSTALLED SPLICING CONNECTOR

- rated for 600 volts for building wire, 1000 volts for fixtures and signs
- designed to splice a wide range of wire sizes



INSTALLATION TOOLING FOR THE BURNDY BURCAP

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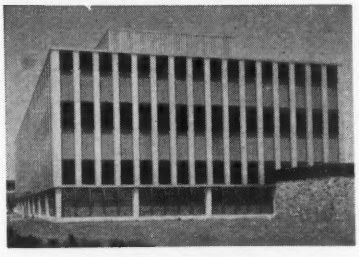
OMATON DIVISION

BURNDY

Reports

A news roundup of items of engineering and design interest from the world over

New material gives spot-proof, movable walls

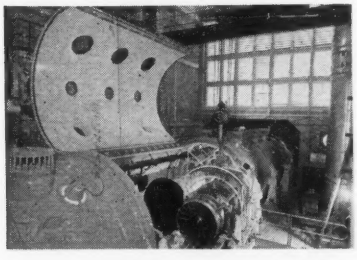


A building that may be the forerunner of many in Canada is Atlas Steel's new administration building. Built of all stainless steel curtain wall panels, it is the first of its kind in Canada.

Stainless steel construction makes possible the rapid erection of complete wall sections, and provides an outside wall that is weatherproof and corrosionproof. Walls are completely demountable in one or more directions to allow for expansion. A new form of colored stainless steel and permanent matte black finish stainless has been used for contrast.

Atlas has used stainless steel in the interior whenever possible, in furniture, railings, free-standing columns and hardware.

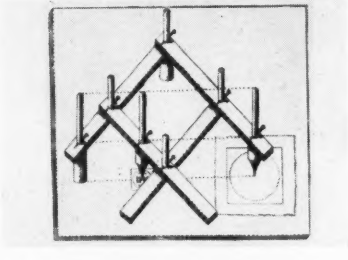
Continuous testing plant is opened in Derby



The continuous testing of turbo-jet and turbo-prop engines is conducted here under altitude conditions up to 70,000 feet (over 13 miles) and up to two-and-a-half times the speed of sound. Electric power equivalent to a small town is provided by a 15,000 hp turbine with a permissible full load of 60 megawatts. There are two test cells in the main plant and a compressor test house.

This $16 million High Altitude Test Plant is the latest addition to the Rolls-Royce Company in Derby, England. Prime Minister Macmillan opened the plant officially on September 26, 1958. It is believed to be the only privately owned establishment of its kind outside the U. S. A.

Drafting returns to the Italian Renaissance



The old adage, "history repeats itself" can be applied to the history of drafting. Draftsmen today are replacing the drafting table with the 17th century easel, thus completing the circuit from easel to table to easel.

At the time of Leonardo da Vinci, architects and engineers were also painters and artists. They used the same tools and worked at the same easel. When modern motion tools were invented in the 19th century, the table was used to hold them. With the recent invention of motion tools for the easel, draftsmen are finding the easel more comfortable. Here we have a pantograph of Bedos de Celles, drawn at the easel in 1640.

Canadians see scope and variety in aluminum

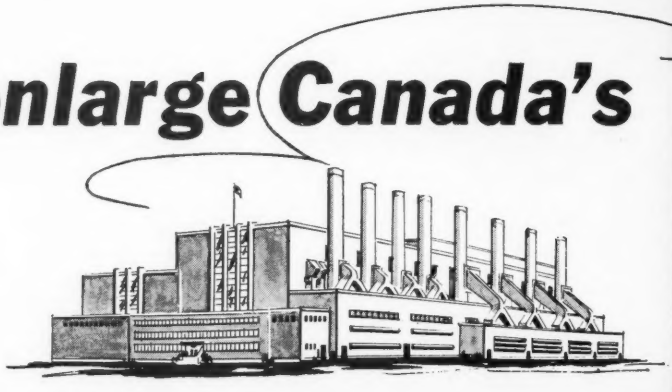
Several hundred different uses of aluminum are displayed in a new permanent showroom of aluminum products in Mount Royal, Quebec. By all accounts, it is one of the most comprehensive collections ever assembled in Canada.

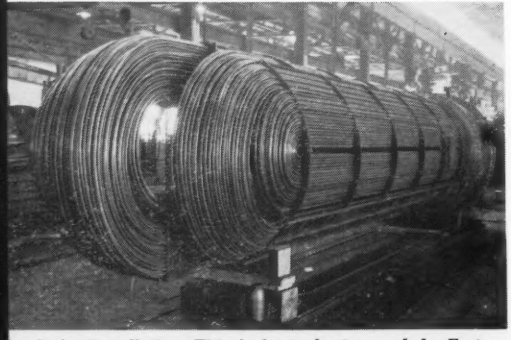
The display traces the production of aluminum from bauxite to ingot. Pictures show various stages of mining, production, rolling and other operations in the aluminum industry. New uses of aluminum in buildings, bridges, ships, yachts, trains, buses, motor cars and household products are shown. It is hoped that this showroom will stimulate new and advanced thinking in the use of aluminum in Canada similar to recent progress in Britain.

In They Go! Condenser for new 200,000 kw unit at Toronto's Richard L. Hearn Station is tubed. A total of 13,800 7/8 in. Noranda Admiralty Brass tubes is used.

NORANDA CONDENSER TUBES

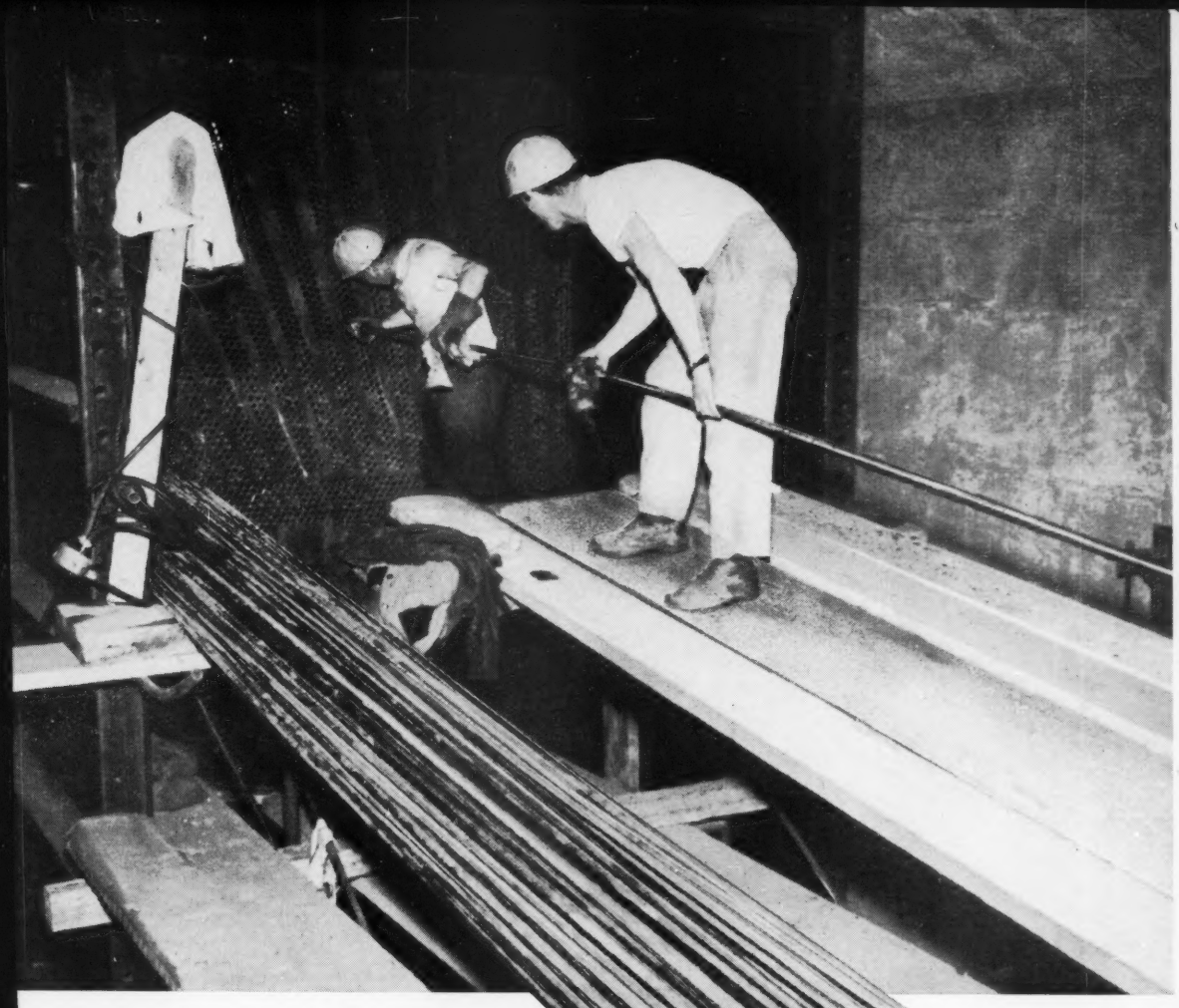
are helping enlarge Canada's





Ready for Installation. This feedwater heater, made by Foster-Wheeler Ltd., St. Catharines, Ontario, uses 54-ft.-long Noranda Cupro-nickel tubes—longest lengths ever produced in Canada.

ONTARIO HYDRO'S RICHARD L. HEARN GENERATING STATION USES 27,600 ADMIRALTY TUBES IN THE NEWEST CONDENSERS... AND THE LONGEST LENGTHS OF CUPRO-NICKEL TUBE EVER PRODUCED IN CANADA SERVE THE FEEDWATER HEATERS



largest steam power station

Already Canada's largest thermal power plant, Ontario Hydro's Richard L. Hearn Generating Station in Toronto, will produce 1,200,000 kilowatts when brought to full capacity in 1960. This station's rapid growth from its 100,000 kilowatt capacity in 1951 is indicative of the great increase in Ontario's power requirements and the planning of Ontario Hydro to meet this need.

Noranda points with pride to its part in this latest extension of the Richard L. Hearn Station, both in furnishing the tubes used in the condensers of two of the new 200,000 kilowatt units, and in supplying the Cupronickel tubes used in the feedwater heaters.

These 54-ft. tubes are actually the longest lengths of Cupronickel tubes ever produced in Canada and are prime examples of Noranda's ability to meet the growing demands of the power and process. industry

In manufacturing and research, Noranda's tube-making facilities are Canada's finest. See THE MAN FROM NORANDA today. He's backed by an experienced Technical Service Staff in meeting any need for tube, pipe, strip or rod.

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Their high mechanical strength and impact and abrasion resistance are important in tooling applications. These properties are also necessary in offering protection to delicate electronic and electric assemblies.

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Epoxies resist corrosion and withstand attack from many liquid and gaseous industrial chemicals, oils and greases. Impervious to moisture penetration, epoxies protect sensitive parts, such as coils and armatures.

CURING ADVANTAGES

Epoxies can cure at room temperature, thus broadening the field of application for these reactive resins. Oven size restrictions are eliminated, and capital investments and production costs are cut.

DIMENSIONAL STABILITY

Not only do epoxy tooling compounds ensure close tolerances in reproduction but they also maintain this accuracy throughout the life of the tool.

ELECTRIC PROPERTIES

Insulating resistance and dielectric strength are superior. Working life is extended and efficiency is improved when assemblies are protected by epoxy resins.

ADHESION

Ability of epoxy formulations to bond such materials as ceramics, plastics, and wood enhances the serviceability of these materials in many fields. Property particularly important in coatings where adhesion of finish is equally important as quality of coating.

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Giving more information about "BAKELITE" epoxy resins, and other plastic raw materials.

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What will it do for you? Will it save money? Will it reliably meet specifications? Will it possess longer life? The answer is "yes" to all three. Because Domite is superior cast iron. Domite is laboratory controlled to meet the need with the properties you require.

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Canada Iron manufactures all grades and types of cast iron, for convenience classified as follows and complying fully with A.S.T.M. A48 where applicable. Here are some typical examples:

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Better than average cast iron. Minimum tensile strength 30,000 psi. Typical Brinell hardness 200.

DOMITE "40":
High strength, medium cross-section. Minimum tensile strength 40,000 psi. Typical Brinell hardness 235.

DOMITE "50":
High strength, heavy cross-section. Minimum tensile strength 50,000 psi. Typical Brinell hardness 260.

DOMITE WEAR RESISTING:
Type WR—A, B, C and D (type depending on service involved).

DOMITE HEAT RESISTING:
Type HR—A, B, C and S (type depending on service involved).

NI-HARD:
Alloyed white iron, Brinell 600-725.

NI-RESIST:
High nickel alloy cast irons for corrosion and heat resistance. Tensile strength 25,000 to 30,000 psi, Brinell 130-180.

DUCTILE NI-RESIST:
Composition and properties as for Ni-Resist, but with 60,000 psi tensile strength and 10% elongation, strong and shock resistant.

NODULOY, DUCTILE IRON:
Nodular or ductile cast iron in a complete range of properties, from 60,000 psi tensile and 20% elongation at 160 Brinell to 180,000 psi tensile at 330 Brinell. Available also in special heat resistant grades.

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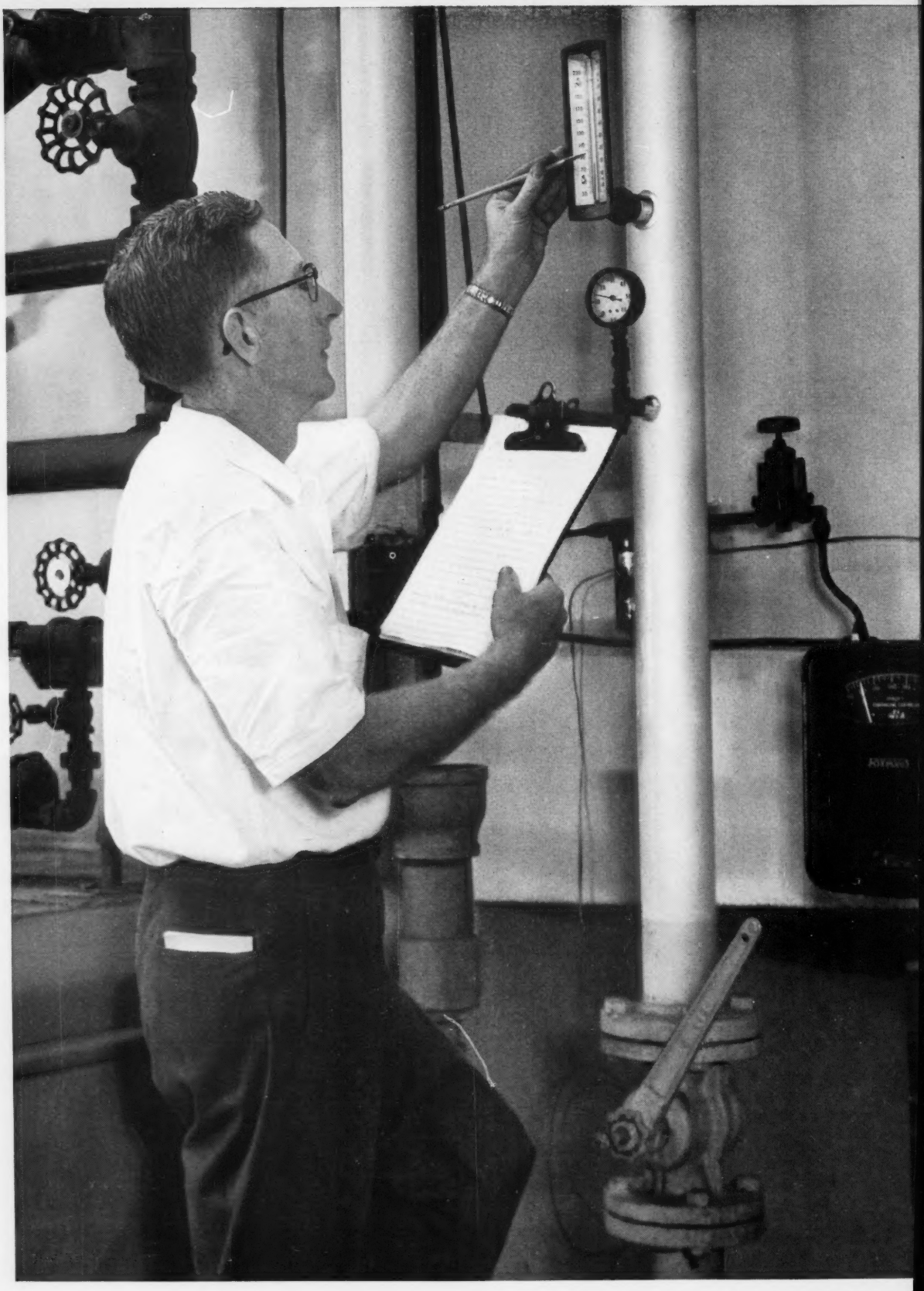
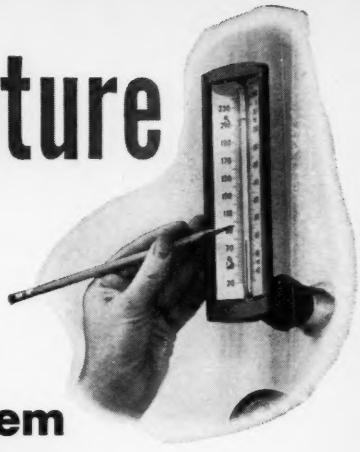


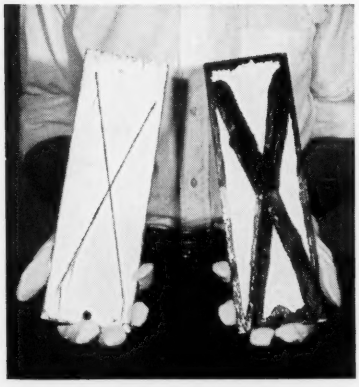
Read the Temperature and SAVE!



New Cold Bonderite System Cuts Heat Costs Up to 70%

The temperature gauges on the input lines of a typical Cold Bonderite System installation tell the story. 40° to 75° cooler in cleaner, rinse and Bonderite than in the conventional hot phosphating installation.

And all that heat saved translates into dollars saved, because chemical costs are comparable, as is the effective protection of the coatings produced.



Salt spray tests show effectiveness of coatings produced by Cold Bonderite System.

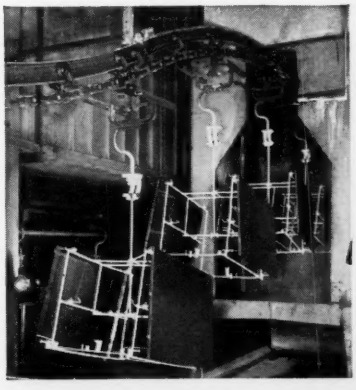
This is a thoroughly tested and proven system. The Cold Bonderite System is in use right now in many plants in many industries. And more are changing to it as they hear about the spectacular savings.

- A large automotive plant reports savings at the rate of 40 carloads of coal per year.
- An appliance manufacturer says the Cold Bonderite System is saving 5¢ per cabinet.
- Another manufacturer shut down one of his boilers because of reduced heat requirements.
- An automotive plant is saving about 12¢ per body.

There are other operational savings besides heat when you use the Cold Bonderite System. You'll use about 25% less water. You'll save electricity because you won't need to run an exhaust fan. You'll save on maintenance. You'll cut down-time, since there's no waiting for cool-off should service be required.

There are so many benefits and advantages to the new Cold Bonderite System that you can't afford not to investigate it for *your* plant.

Call or write today!



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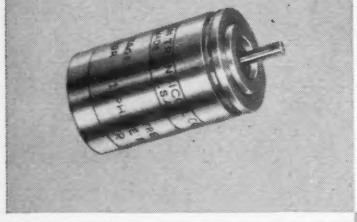
NEW

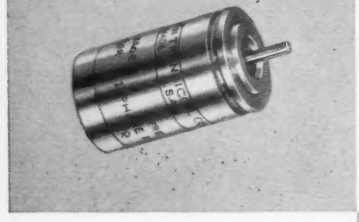
NEW TYPE 6 SERVO MOTORS

Here's one of the smallest precision servo motor series currently available. The new Daystrom Transicoil Type 6 Motors are wound for 26-, 33-, and 52-volt operation. Control phase is center tapped for operation with transistor drive. These Motors develop .125 oz-in. min. stall torque and 6200 RPM free speed. Each unit weighs only .9 oz. and is less than 1¼" overall.



NEW TYPE 8 INDUCTIVE POTENTIOMETER

This Inductive Potentiometer is an infinite resolution a-c potentiometer whose output voltage is linear rather than sinusoidal with the angle. Output voltage phase is dependent upon the direction of shaft displacement from null. When operated into load resistors not less than those specified, output is linear within .25% through an angular rotation of +85° through null to -85°.



NEW TYPE 8 SYNCHROS

The new Daystrom Transicoil Type 8 Synchro Line consists of transmitters, control transformers, differentials and repeaters. Dimensions equal to BuOrd Size 8. Operation: 115V 400 cycles or 26V 400 cycles. Accuracy of ± 10 minutes is standard. Other accuracies are available upon request. Corrosion resistant construction throughout. Conforms to MIL-E-5272-A. Operating temperature range is -54C to +125C. Higher temperature units also available.

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Here's inertial damping with no reduction in no-load speed! This new Type 11 Motor (BuOrd size 11) provides acceleration or deceleration damping in high-speed and high-gain servo systems. In non-critical applications, this motor can be used as a low-cost substitute for damping motor generators.

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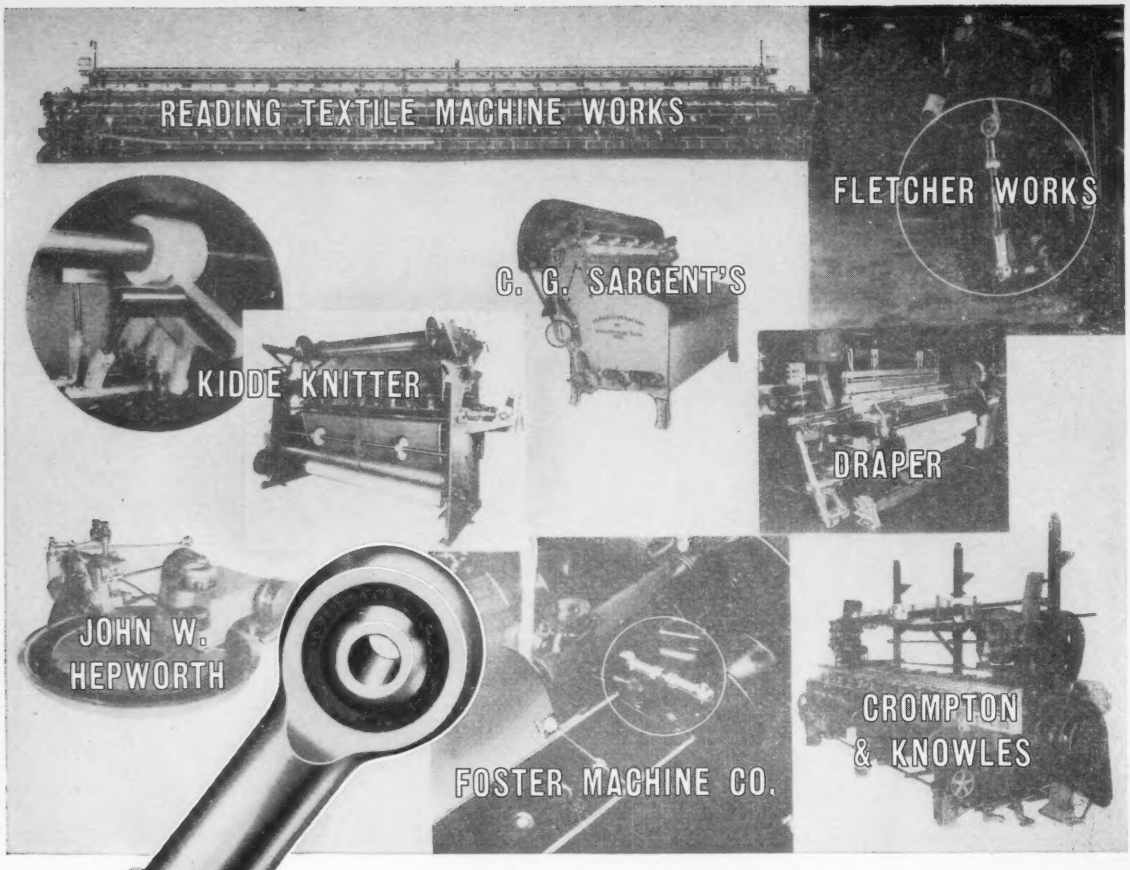

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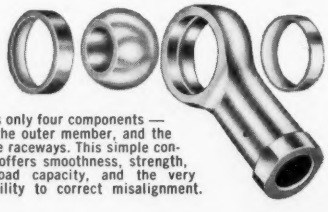
The textile industry has found literally hundreds of uses for the versatile Unibal Rod Ends. They correct inherent misalignments on the *Crompton & Knowles* Narrow Fabric Loom. On the *Draper* X-2 loom, one Unibal now takes the place of several parts formerly used. *Fletcher* uses Unibal to correct misalignment in the shuttle motion of a label loom. The *Foster* Pineapple Coning Machine uses Unibal for flexibility, freedom of motions, and ruggedness to withstand vibration. The *Hepworth* Sweater-Looper uses Unibal at both ends of all drive rods. The *Kidde* Knitter which produces lace edgings, veilings, etc. uses Unibal Rod Ends as suspension hangers. Unibal is used in the covering knife motion on the *Reading* Full-Fashion knitting machines. On the *C. G. Sargent* Automatic Feeder which combs out the wool, Unibal improves the operation of the driving mechanism.

The common function of all push-pull rod assemblies is the transmission of force and motion from one machine component to another. A Heim Unibal rod end at one or both ends of the rods in an assembly assures smooth, trouble-free operation. The Unibal device can be used for many other mechanical functions, however, and its versatility makes it a welcome accessory in solving many difficult support problems, such as the suspension hangers as used on the Kidde Knitter.



Unibal has only four components — the ball, the outer member, and the two bronze raceways. This simple construction offers smoothness, strength, greater load capacity, and the very useful ability to correct misalignment.

Heim bearings are sold through the country's leading bearing distributors. Write for complete catalog and/or engineering help.

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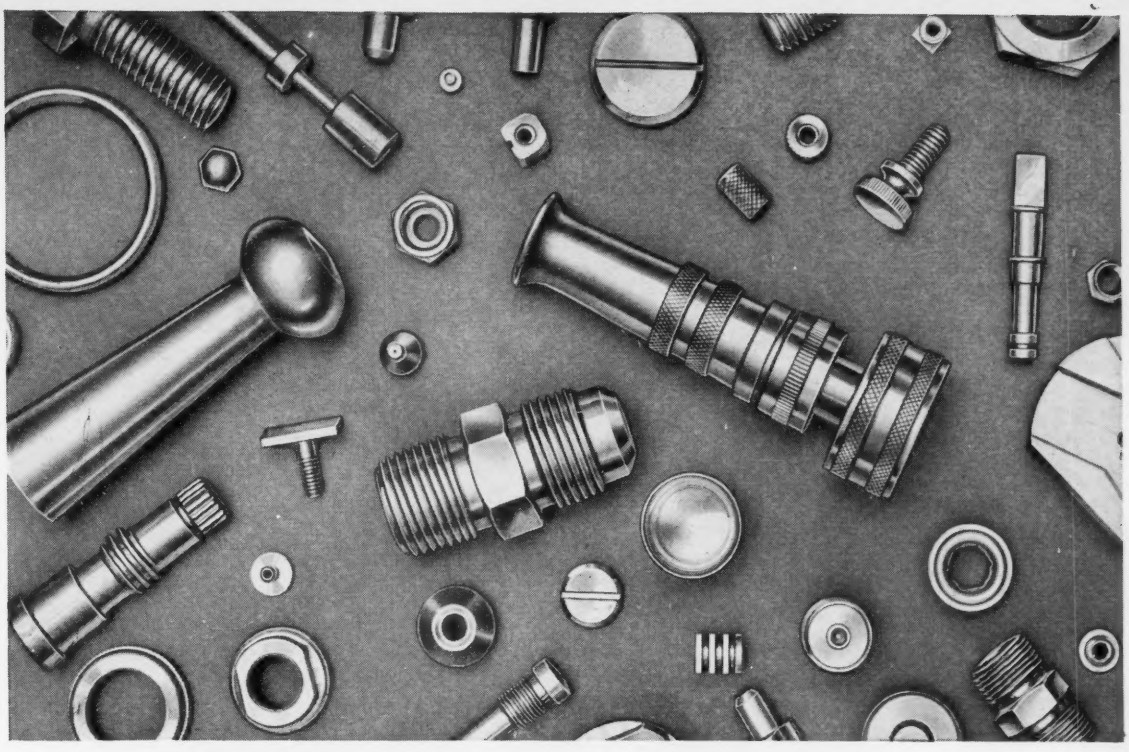

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for Screw Machine Products

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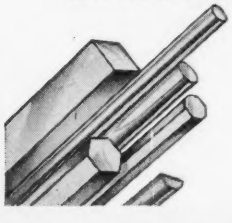
The use of Anaconda Free Cutting Brass Rods frequently affords an excellent opportunity to cut costs by increasing the rate of production; and to obtain a higher-quality, better-looking, and more durable plated article. For more detailed information write for publication B-14, "Anaconda Rods—for Screw Machine Products" and Publication B-3, "Machining Copper and Copper Alloys". Anaconda American Brass Limited, New Toronto, Toronto 14, Ontario. Sales Offices: Montreal and Vancouver.

Photographs courtesy Canadian Acme Screw and Gear Limited.



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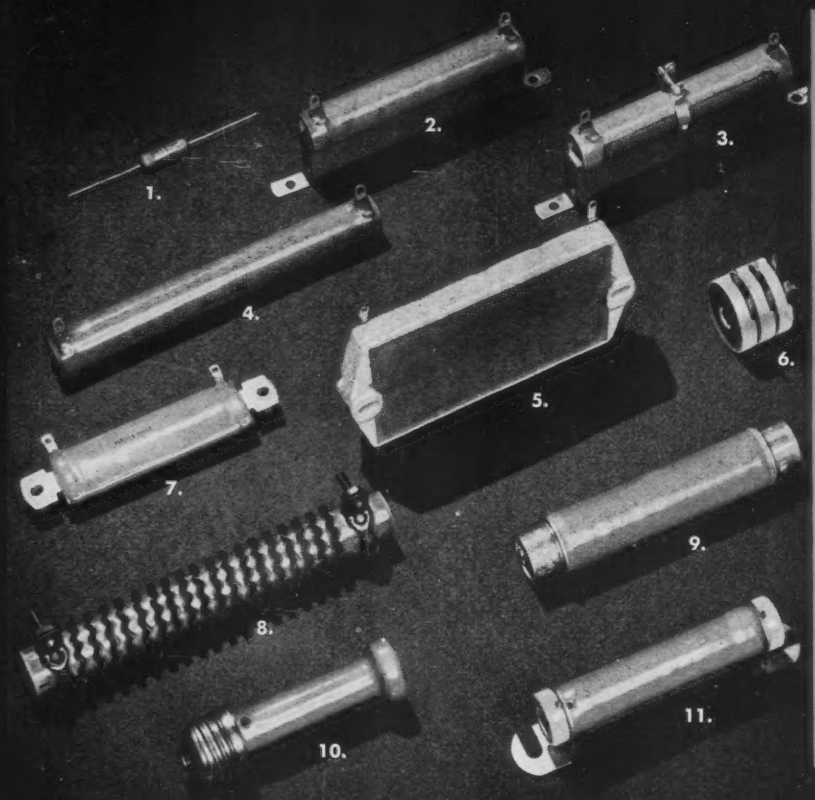
FOR SCREW MACHINE PRODUCTS **Trade Mark Reg'd.*



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1. AXIOHM* Used in electronic equipment requiring miniature power resistors. **2. FIXED VITROHM*** Used for voltage dropping and current limiting. **3. ADJUSTOHM*** Gives circuit adjustability for voltage dividing or regulating purposes. **4. NON-INDUCTIVE*** For low inductance and distributed capacitance in high frequency circuits. **5. PLAQOHM*** Used in compact, high frequency electronic equipment. **6. DISCOHM*** A miniature resistor for low inductance values and distributed capacitance. **7. STRIPOHM*** For compact aviation, communication and navigation equipment. **8. RIBFLEX** Used in circuits where high wattage must be dissipated in small space. **9. FERRULE TERMINAL** For rapid interchangeability of resistance values or resistor replacement. **10. SCREW BASE** With an Edison screw base for mounting to provide rapid means of changing resistance. **11. BRACKET TERMINAL** Has leads silver brazed to brackets for easy interchange or renewal of unit.

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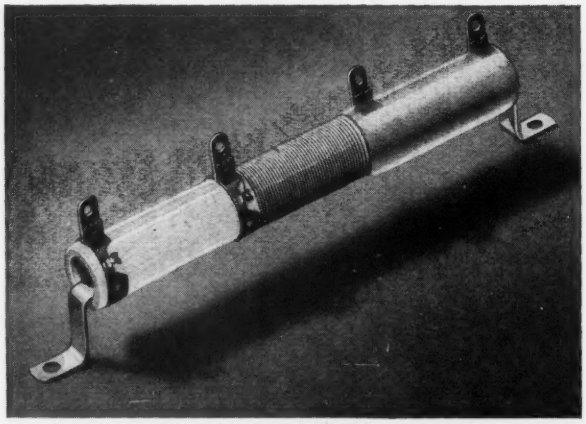
For full information on Vitrohm resistors, write for our Catalog 15, to Ward Leonard of Canada Ltd., 1070 Birchmount Rd., Toronto 16.

5802



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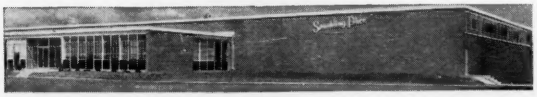

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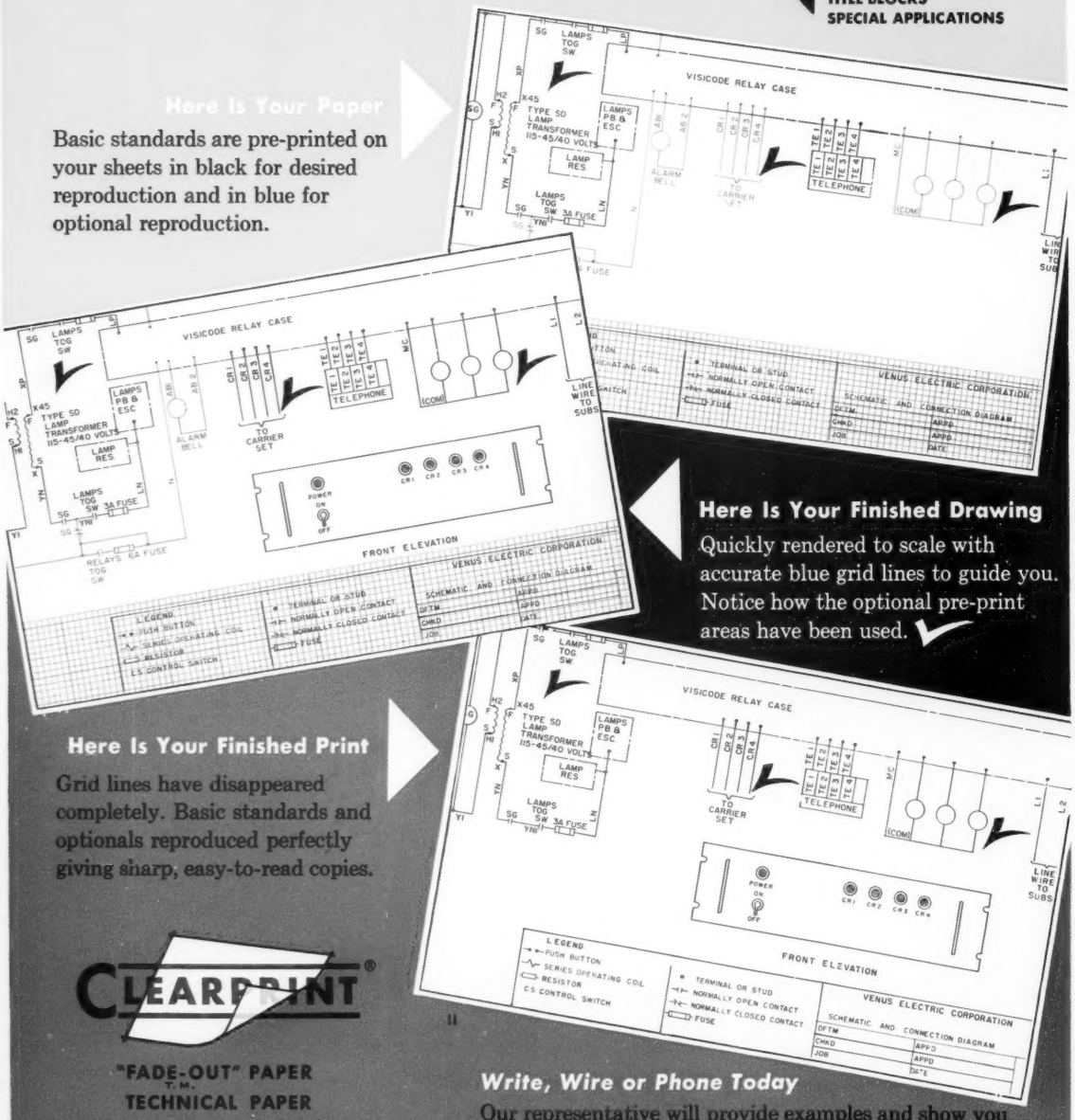

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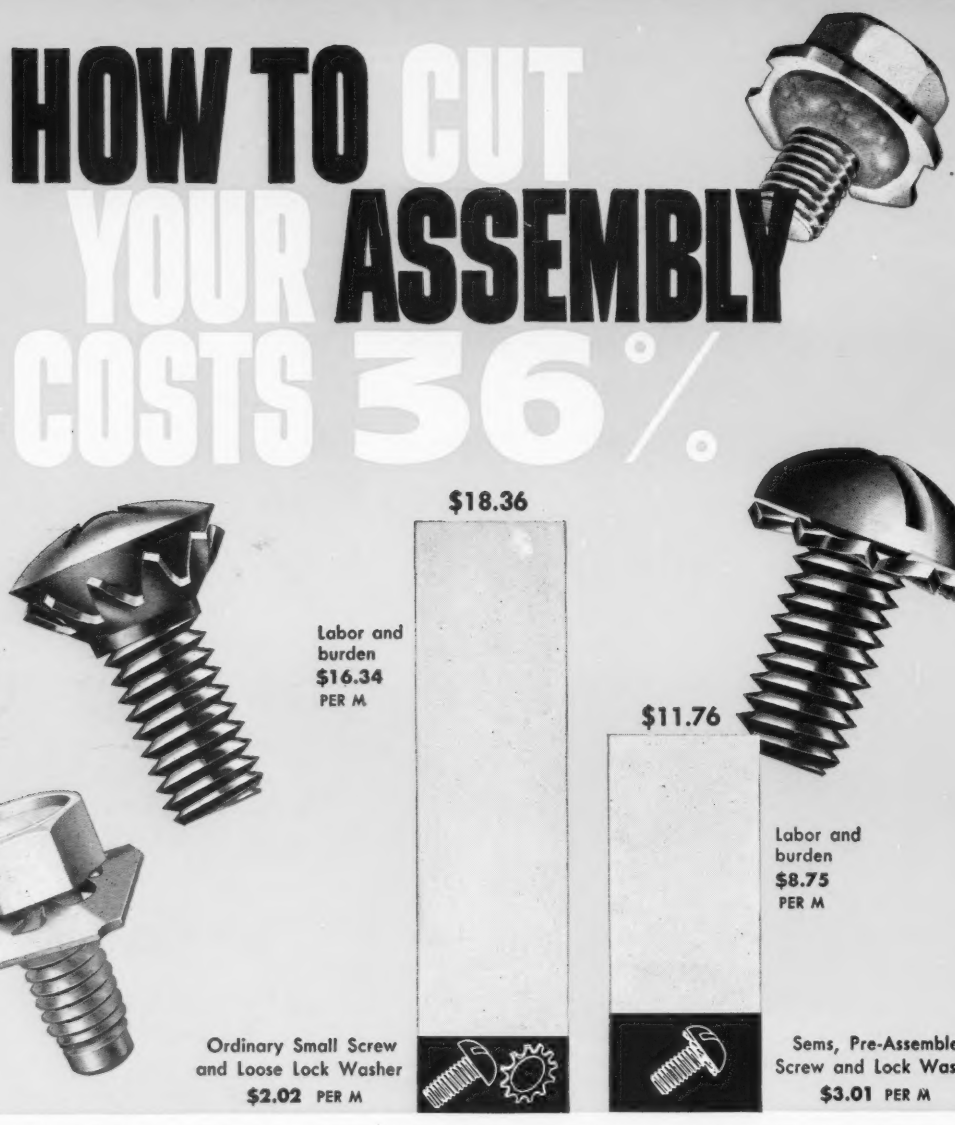
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Shakeproof recently concluded an analysis of fastening applications showing that the price of common fasteners is only 19% of the total cost, while labor and burden required to "install" the fasteners represent 81% of the total cost. This study proves that greater savings can be made with labor-saving fasteners than with fasteners purchased on the basis of lowest price per thousand.

To learn more about this concept of assembly savings, write for the Shakeproof "Price-Per-Thousand" booklet.

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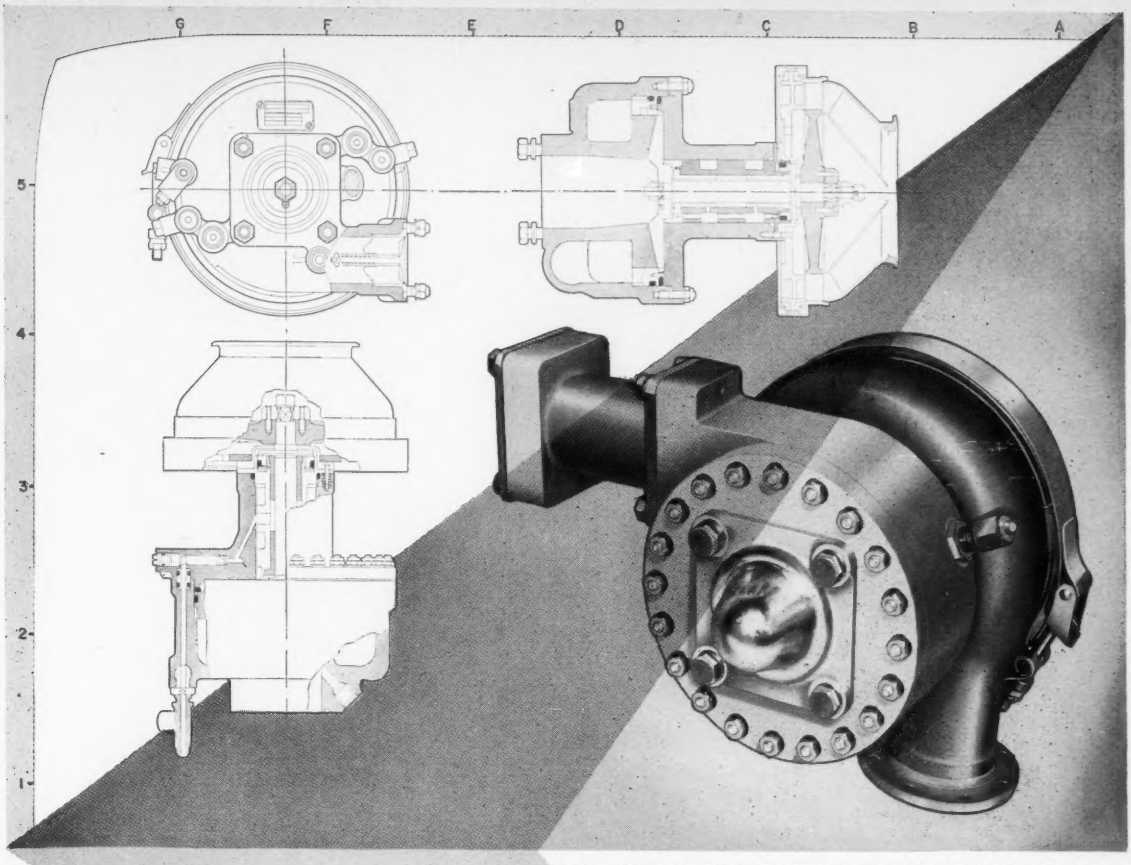

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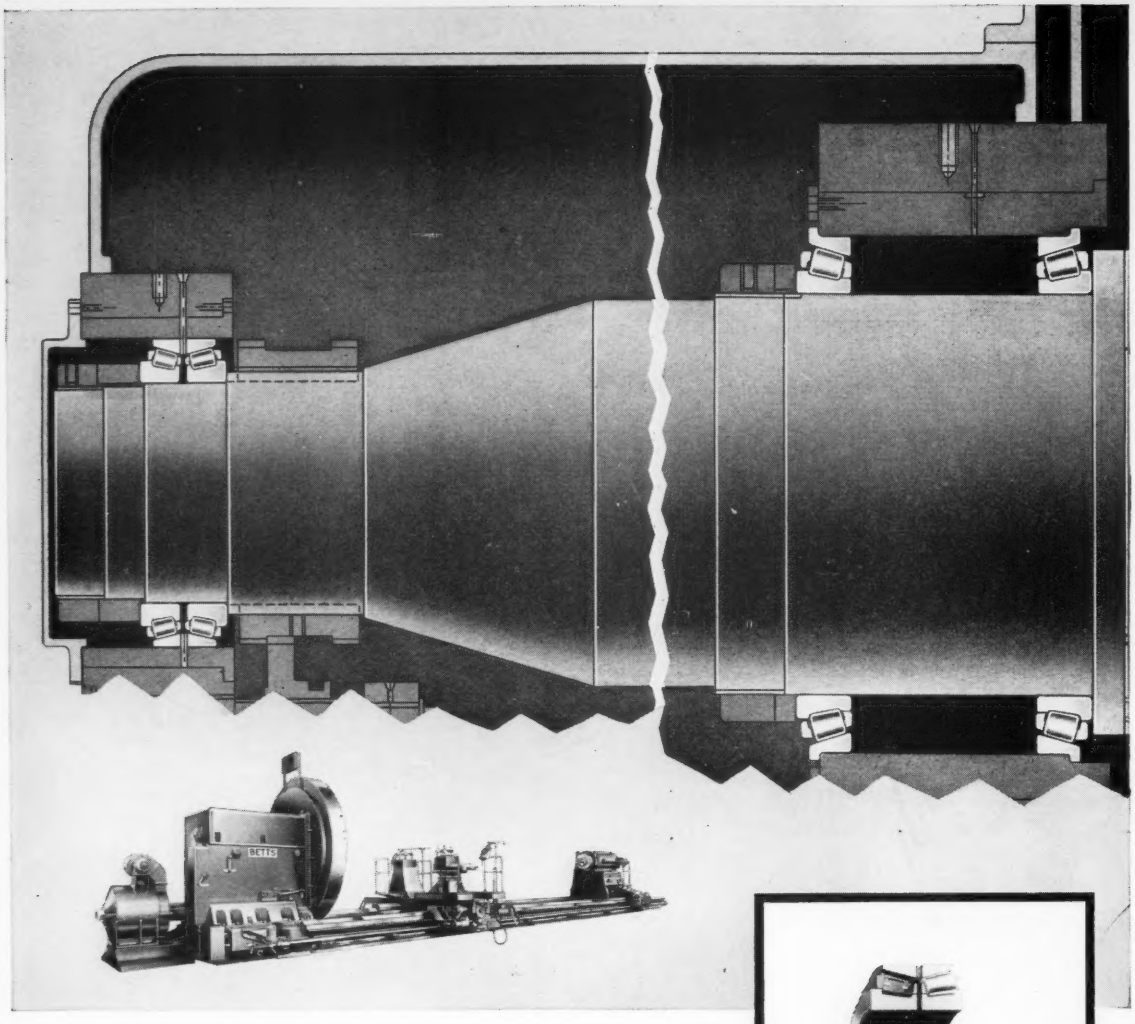
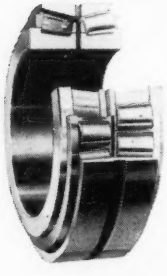


Torrington ultra-precision in large sizes!

The two-row Tapered Roller Bearing shown above is 21.5000″ OD, has a maximum radial and face runout of .0003″, with rotating inner ring and stationary outer ring. At 100 rpm, its radial capacity is 304,000 pounds, its thrust capacity 215,000 pounds.

The single-row Tapered Roller Bearing is 36.000″ OD, with a maximum radial and face runout of .0003″. At 100 rpm, its radial capacity is 319,000 pounds, thrust capacity 272,000 pounds.

Precision in large bearings reflects Torrington's specialized skills and equipment, which enter into the production of every Torrington Bearing, large or small, special or standard. You may not require such precision, but you can be sure your bearing order will receive the care that makes Torrington quality a by-word of industry. **The Torrington Company, South Bend 21, Ind.—and Torrington, Conn.**



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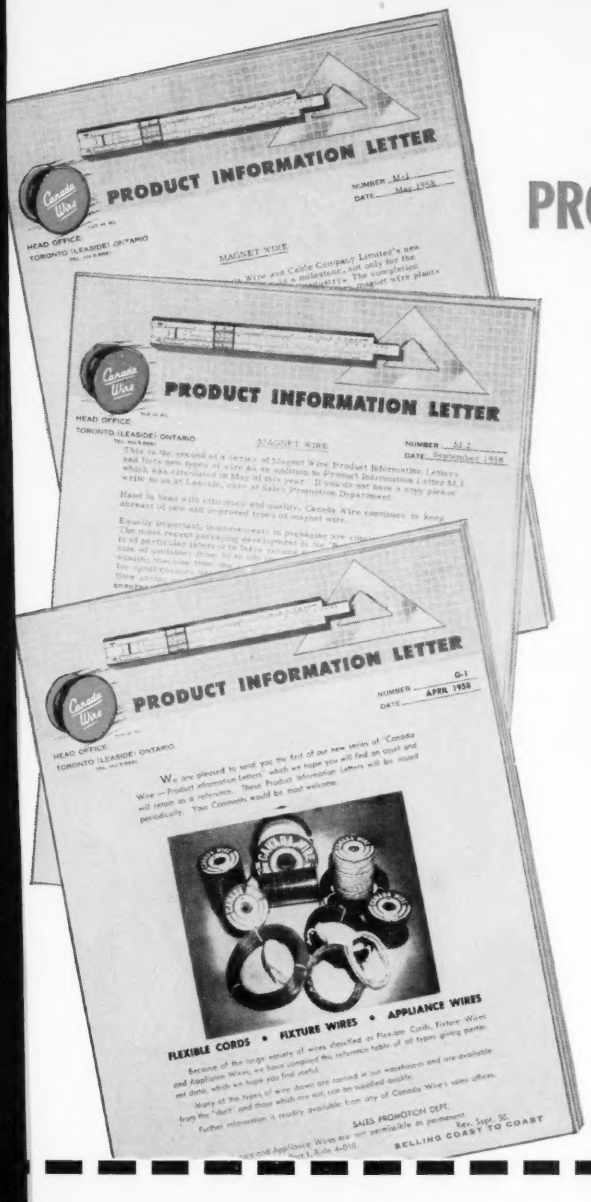
PRODUCT INFORMATION LETTER
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FLEXIBLE CORDS • FIXTURE WIRES • APPLIANCE WIRES

Canada Wire

PRODUCT INFORMATION LETTERS

MAGNET WIRE (Letter M.1). Lists the extensive range of Magnet Wires with a breakdown of the 21 insulating materials available, together with their thermal classifications, specifications and characteristics.

MAGNET WIRE (Letter M.2). Gives helpful details on the most recent magnet wire packaging developments and complete specifications on three new types of magnet wire not included in Letter M.1: Polytemp (rectangular and square), Polysol-N (Polysol-Nylon) and Polybond (Polysol Bondel).

FLEXIBLE CORDS, FIXTURE WIRES, APPLIANCE WIRES (Letter G.1). Contains complete reference tables giving type of insulation, number and size of conductors, insulation thickness, and the maximum operating temperatures and voltages.

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For additional information, call a Skinner Distributor listed below or write to Dept. 35N.

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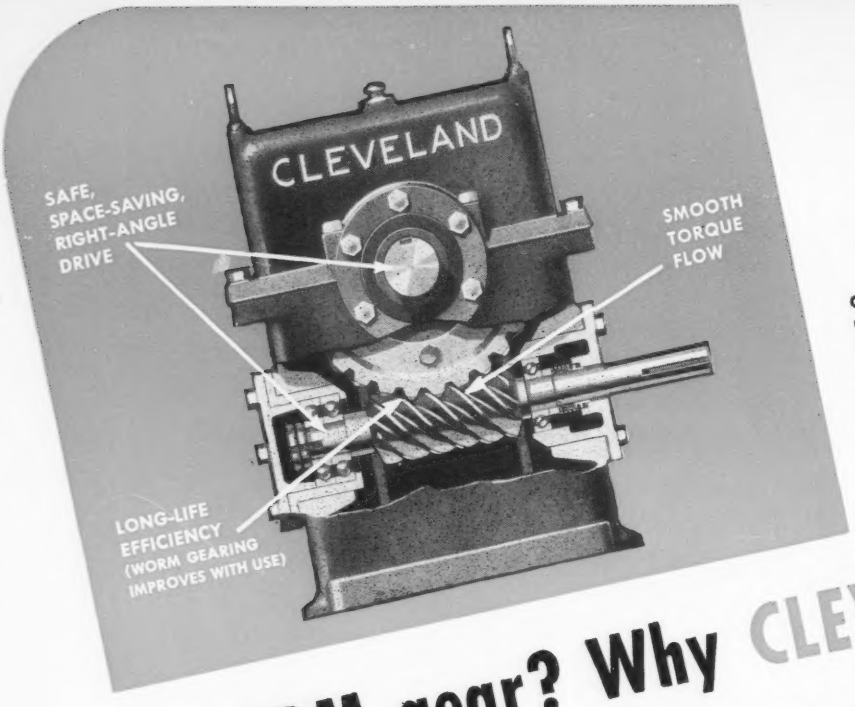

Cutaway shows compact interior design and construction of a typical Cleveland worm gear speed reducer, used in thousands of plants. Clevelands save floor space—are simple to install and maintain. A minimum number of moving parts practically eliminates trouble.

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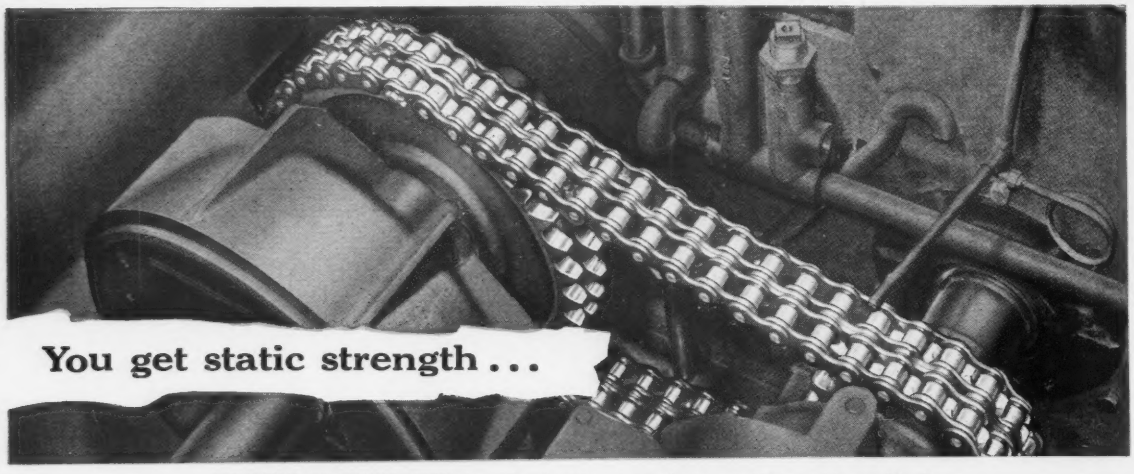
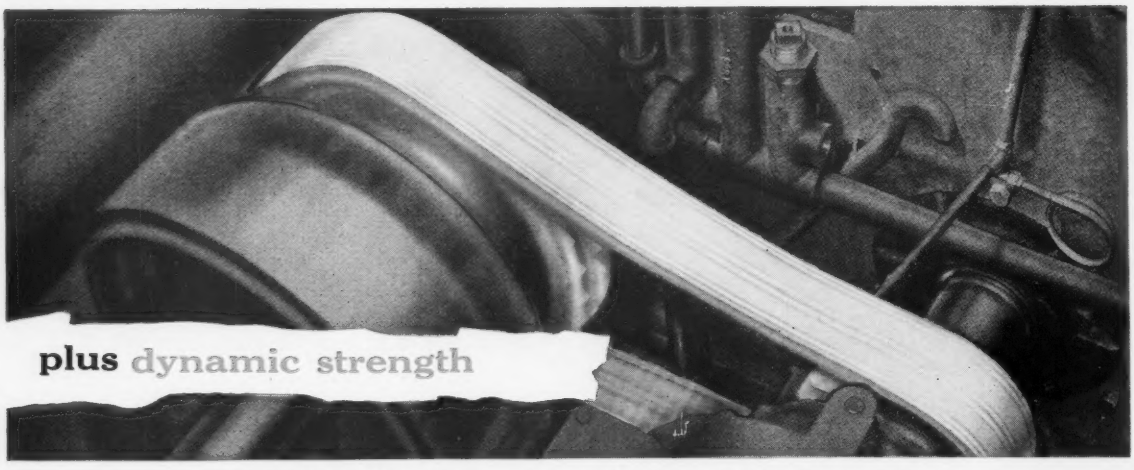
Why tough-service drive and conveyor jobs demand LINK-BELT roller chain



RESISTANCE TO TENSILE STRESS is achieved with properly heat-treated, accurately machined side bars made of premium steel and fitted with properly hardened pins, bushings, rollers.



STRENGTH OF CHAIN IN MOTION results from such refinements as pitch-hole preparation, micro-finish of parts, special processing of side bars, pre-lubrication, rigid quality control.

THE *greater dynamic strength* found in Link-Belt precision steel roller chain is essential for long life on today's harder-working drives and conveyors. This added capacity to resist shock loads, centrifugal loads and similar stresses is achieved only because Link-Belt adds refinements in manufacture.

These include lock-type bushings, shot-peened rollers, pre-stressing, closer heat-treat control. The result: a precision chain that takes stresses in stride . . . provides smoother, more efficient performance that measurably outlasts ordinary roller chain — reduces costs.

For full data on Link-Belt roller chain, see your Link-Belt office or authorized stock-carrying distributor.

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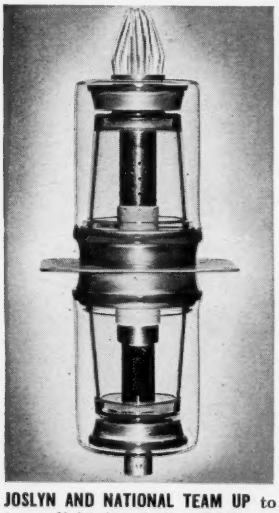
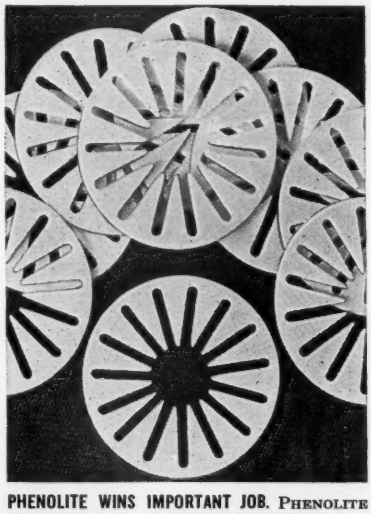
THE NATIONAL SCENE

BIG LIGHTNING HAZARD IN AIRCRAFT, flying through electrical storms, is the radio antenna. Metal skin and structural members insulate the ship against lightning. The antenna—insulated from the metallic skin—provides a path through which current can enter the plane. Simple spark gaps furnish some protection. But they cannot control long, cloud-to-cloud discharges and have never proved fully effective.



JOSLYN AND NATIONAL TEAM UP to tame lightning bolts. With an assist from National PHENOLITE, the Joslyn Aircraft Arrester eliminates lightning hazards—even at high altitudes. Attached to the plane's radio antenna, the arrester permits the flow of radio energy, but blocks lightning discharges and deflects them harmlessly.



PHENOLITE WINS IMPORTANT JOB. PHENOLITE silicone glass Grade G-7-830 forms the separator in the Joslyn Aircraft Arrester—holds essential metal spring contacts in position and acts as an arc barrier. For this, it must have unusual strength, good electrical characteristics, superior punchability—also be fungus proof and withstand severe vibration for long periods. PHENOLITE meets all of these requirements.

NATIONAL CAN HELP YOU

reduce unit product cost or improve product performance at no added cost. Here's why . . . You can select the "one best material" from over 100 grades of PHENOLITE®, Vulcanized Fibre and National Nylon—without compromise in properties or cost. You can simplify production and purchasing with the timed delivery of 100% usable parts—from a single reliable source. You gain competitively with National's new materials and grades—the direct results of programmed materials-research.

You benefit by calling National first. Check telephone directory Yellow Pages or write Toronto direct. Address Dept. **N-11.**

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ATLANTIC & HANNA AVENUES, TORONTO

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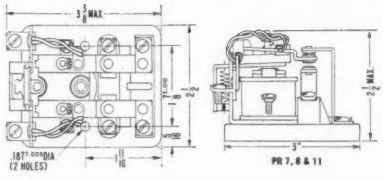
for high current/voltage switching

HEAVY DUTY construction means long-term dependability when switching up to 20 amperes (double break contacts). Here is a ruggedly built relay, packed with high quality features, yet economically priced.

The PR's full floating movable contact carrier, for example, provides excellent contact pressure and ample wipe for self-cleaning contact action. The coil is centrifugally impregnated with top-grade varnish to eliminate moisture traps.

Contact arrangements up to DPDT are available. The PR has been adapted for printed circuitry and heavy duty plug-in applications.

All standard AC actuated PR relays may carry the UL and Canadian Standards Association seals of approval. Write or call for complete information.



GENERAL SPECIFICATIONS:
Breakdown Voltage: 1500 volts rms min. between all elements and ground.
Ambient Temperature: DC: —55° to +85°C.
AC: —55° to +55°C.
Terminals: Heavy duty screw type. Standard printed circuit pins or plug-in on request.
Enclosures: PR dust cover.

CONTACTS:
Arrangements: Up to 2 Form C (DPDT).
Material: 5/16" dia. silver or silver cadmium oxide. (Others available)
Load: Single break: 15 amps; Double break: 20 amps at 115 volts 60 cycle AC resistive.

AUXILIARY CONTACTS:
Arrangements: 1 Form A, B or C.
Material: 3/16" diameter silver
Rating: 5 amps at 115 volts 60 cycle AC resistive.

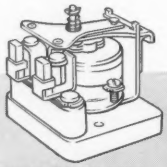
COILS:
Resistance: 64,000 ohms maximum.
Power: 1.8 watts DC; 9.8 volt-amps AC.
Duty: Continuous AC or DC (DC coils will withstand 1 watts at 25°C).
Insulation: Centrifugally impregnated with high quali varnish.
Mountings: 2 holes .187" diameter 1⅞" o.c.

PR Relays Approved By Underwriters' Laboratories and Canadian Standards Association

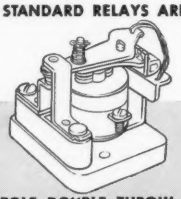
Type	Contact Arrangement*	Type	Contact Arrangement
PR1AY	SPST-NO	PR5AY	SPDT
PR2AY	SPST-NC	PR7AY	DPST-NO
PR3AY	SPDT-NO-DM	PR8AY	DPST-NC
PR4AY	SPDT-NC-DB	PR11AY	DPDT

These relays are available in any of the followir operating voltages: 6, 12, 24, 48, 115, 208, 230, or 4 volts 50/60 cycles AC.
The contacts are rated at: 13 amps, 115 volts AC. 6 amps, 230 volts AC. 1 hp for 115 or 230 volt AC motor
Any relays deviating electrically or physically from the standard models will not carry U/L or CSA approval.
*Read: NO normally open, NC normally closed, D double break, DM double make.

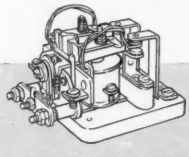
P&B STANDARD RELAYS ARE AVAILABLE AT YOUR LOCAL ELECTRONIC PARTS DISTRIBUTOR



PR RELAY WITH MAGNETIC BLOW-OUTS
Models PR3 and PR7 can be supplied with alnico magnets to suppress arcs on DC loads over 1200 watts.



SINGLE POLE DOUBLE THROW VERSION
PR 5 (SPDT) has all the heavy-duty features of other models in this series.



PR WITH AUXILIARY CONTACTS
All PR models can be equipped with auxilliary contacts in 1 Form A, B, or C arrangements.

AMF **POTTER & BRUMFIELD** CANADA LT
Guelph, Ontario

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THE MOST CONSISTENTLY SUCCESSFUL PERFORMERS in any container lineup are HYGRADE Corrugated Containers.

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HYGRADE CONTAINERS LIMITED

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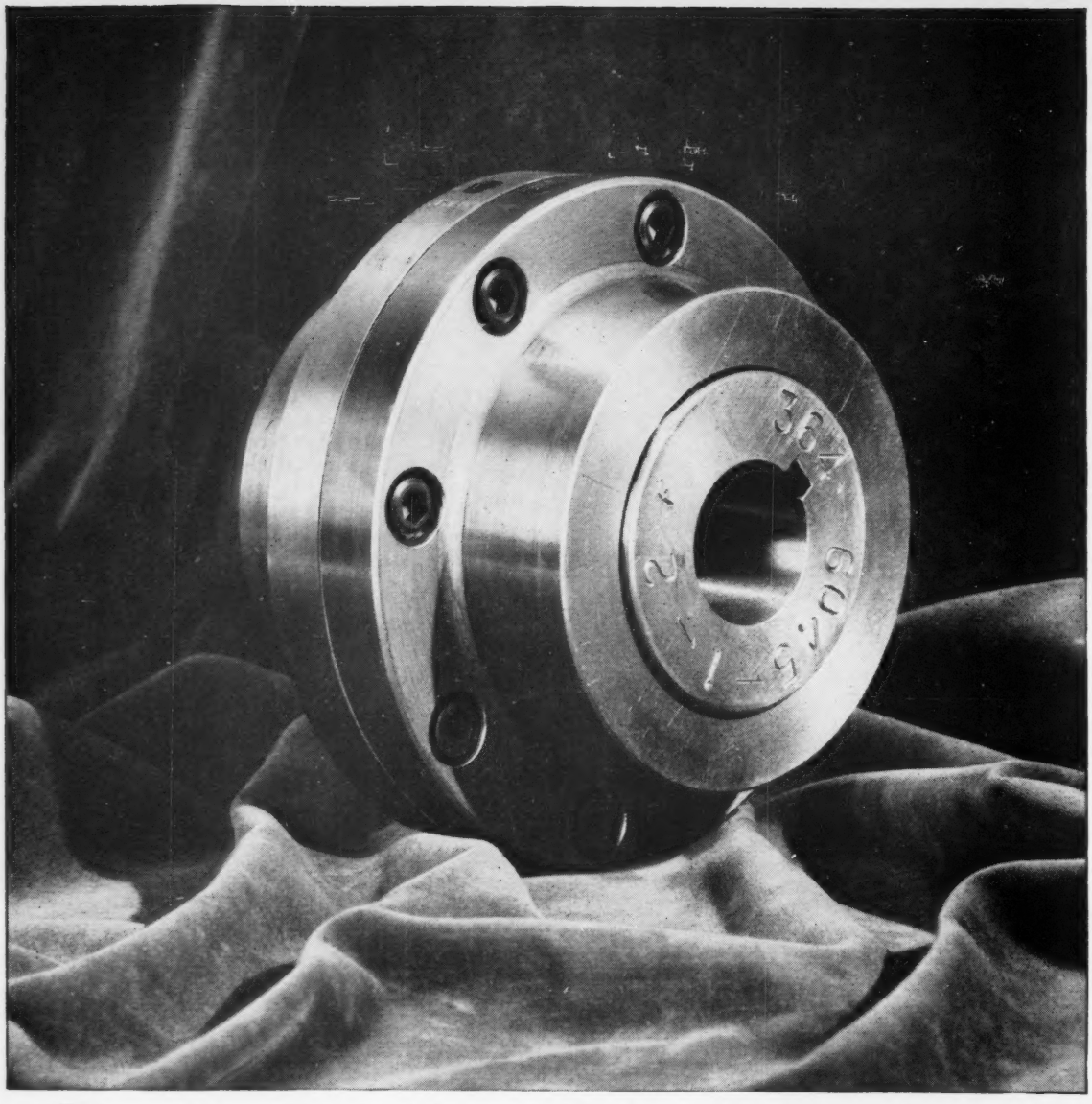

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Write for your copy of Bulletin 454 today!

The products you design today to meet the demands of tomorrow must be carefully engineered right down to the smallest component. The product must be geared to the demands of an "automation minded" world and the competition of the years ahead. Production schedules can't be kept up when machinery is down for maintenance. No component you can build into your products will mean more to its efficient performance than the bearing units carrying the load. The exclusive combination of features found only in SEALMASTER self-aligning, pre-lubricated Bearing Units are important to your product's continuous performance and acceptance.

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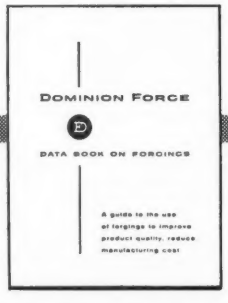
A DIVISION OF STEPHENS-ADAMSON MFG. CO. OF CANADA LTD., BELLEVILLE, ONTARIO

D Quality

If forgings are a component,
your product can be better, stronger, safer because of
the big extras in Dominion's forgings


DOMINION FORGE
DATA BOOK ON FORGINGS
A guide to the use of forgings to improve product quality, reduce manufacturing cost

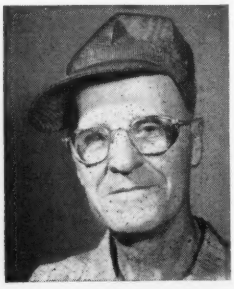
FREE! Handy informative guide that ought to be at your elbow. Dominion Forge's **DATA BOOK ON FORGINGS,** packed with useful facts, illustrates and describes Dominion's unique facilities. Write for your free copy. No obligation, of course.

Lower manufacturing costs, a superior product, little if any need for field service and repairs are what you expect—and *get*—when one or more of your product's components are forged.

Something else on which you can count is a better, stronger, safer product if your forgings are from Dominion Forge Limited, one of North America's great forges.

While Dominion's forging and auxiliary facilities cannot be matched for versatility by any other commercial forge on the continent, that's simply a guarantee of service. Dominion's insistence on a standard of quality unsurpassed in its industry is what assures a consistency of quality that is equally unsurpassed. It's a big *extra*. A big extra that adds up to a better, stronger, safer product. *A big extra that costs you nothing extra!*

Your Dominion Forge *forging engineer's* first responsibility is to help you get *all* the extras in forgings Dominion delivers. Put his training and experience to work for you. You'll find it pays.



DIE SINKER Ernie Berthiaume is one of over 125 members of Dominion Forge's Quarter Century Club—an aggregation of forging experience on which you can count.

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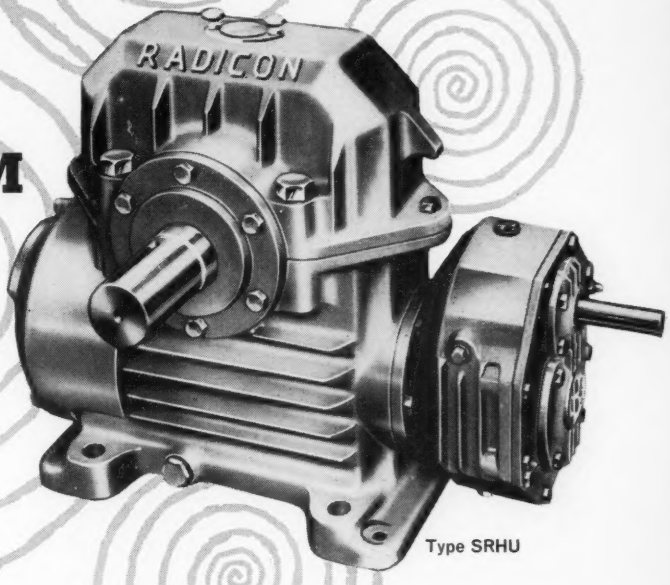
RADICON HELICAL-WORM REDUCERS



Type SRHU

New David Brown Helical Unit mounted on standard Radicon, permits speed reductions of up to 250/1 with high efficiency.

Standard Radicon units are also available as usual in a complete range, fractional and integral up to 100 H.P. ratios from 5/1 to 60/1.

NO WAITING!

Now available for **immediate deliveries from stock**

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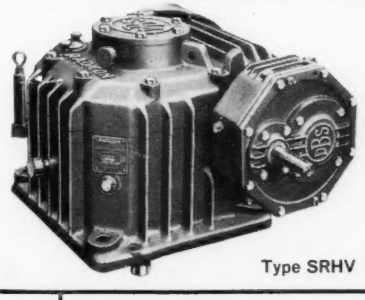
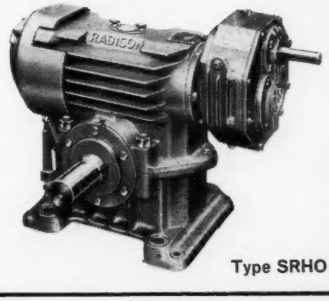


Type SRHV



Type SRHO

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DAVID BROWN (CANADA) LIMITED

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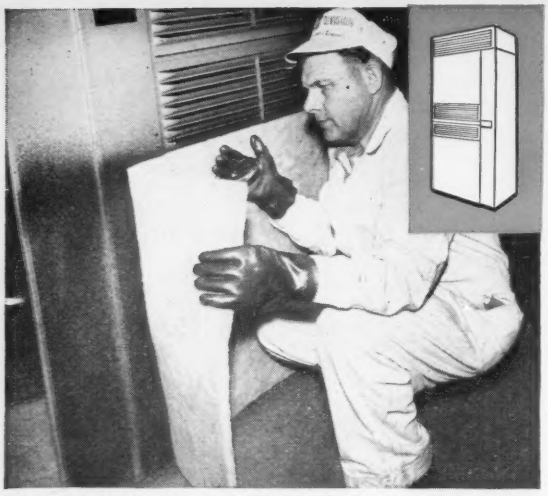
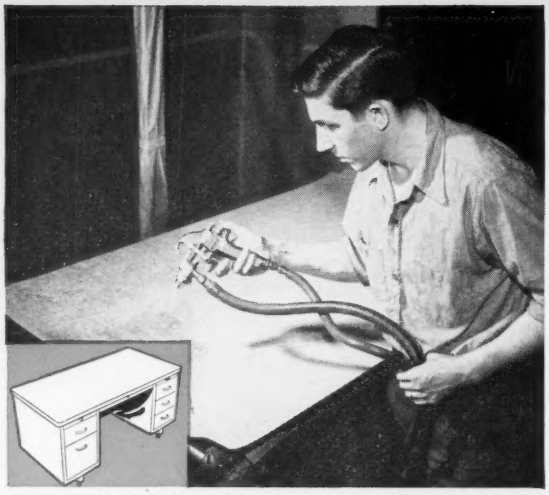
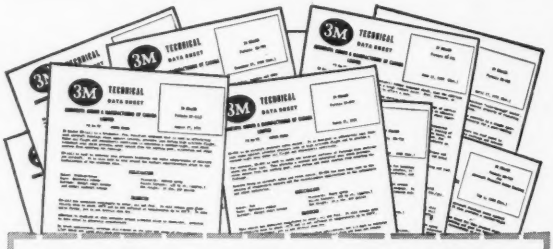


TRANE CO. OF CANADA LTD. SAVES TIME insulating air conditioners by using specially designed 3M Adhesives. These adhesives hold the insulation tightly to the metal. No drying time is needed. The insulation never comes loose.



OFFICE SPECIALTY MFG. CO. LTD. SAVES COSTS in production by using another specially designed 3M Adhesive. Every desk they make has its top laminated with 3M Adhesive. Speed of application and holding power are just two of the reasons.

CONCRETE PIPE LIMITED SAVES LEAKS by using rubber gaskets adhered tightly to concrete by a 3M Adhesive. The combination of the adhesive and gasket defies the elements.



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Brightness alone is not the true measure of hydraulic tubing quality!

*Bright ID and OD surfaces are important in hydraulic tubing. But mere brightness is not enough! Superior SAE Hydraulic Tubing delivers unsurpassed brightness; plus these other vitally important advantages—

High ductility! Furnished in dead-soft annealed temper, Superior hydraulic tubing flares easily, bends without pinching, is readily fabricated for any hydraulic application.

Non-aging steel! All Superior carbon hydraulic tubing is made of selected non-aging steel. It keeps its ductility. Will not become brittle with age. Carbon content is limited to .12% maximum.

Fully tested! And not mere random sample testing! Every length of Superior SAE Hydraulic Tubing is 100% hydrostatically tested at maximum working pressure—giving you realistic performance insurance.

Rust preventive coating! All Superior SAE Hydraulic Tubing is shipped to you specially coated with a rust preventive on both inside and outside surfaces. Not just a coating of oil!

Special processing gives Superior hydraulic tubing an unusually bright, lustrous, smooth, clean ID and OD finish. No premium costs to pay for bright, bright surfaces with Superior tubing!

Available coast to coast through leading warehouse distributors, each a steel service center. Contact your nearest Superior distributor—or, for more information, send for a free copy of Bulletin 39. Superior Tube Company, 2052 Germantown Ave., Norristown, Pa.

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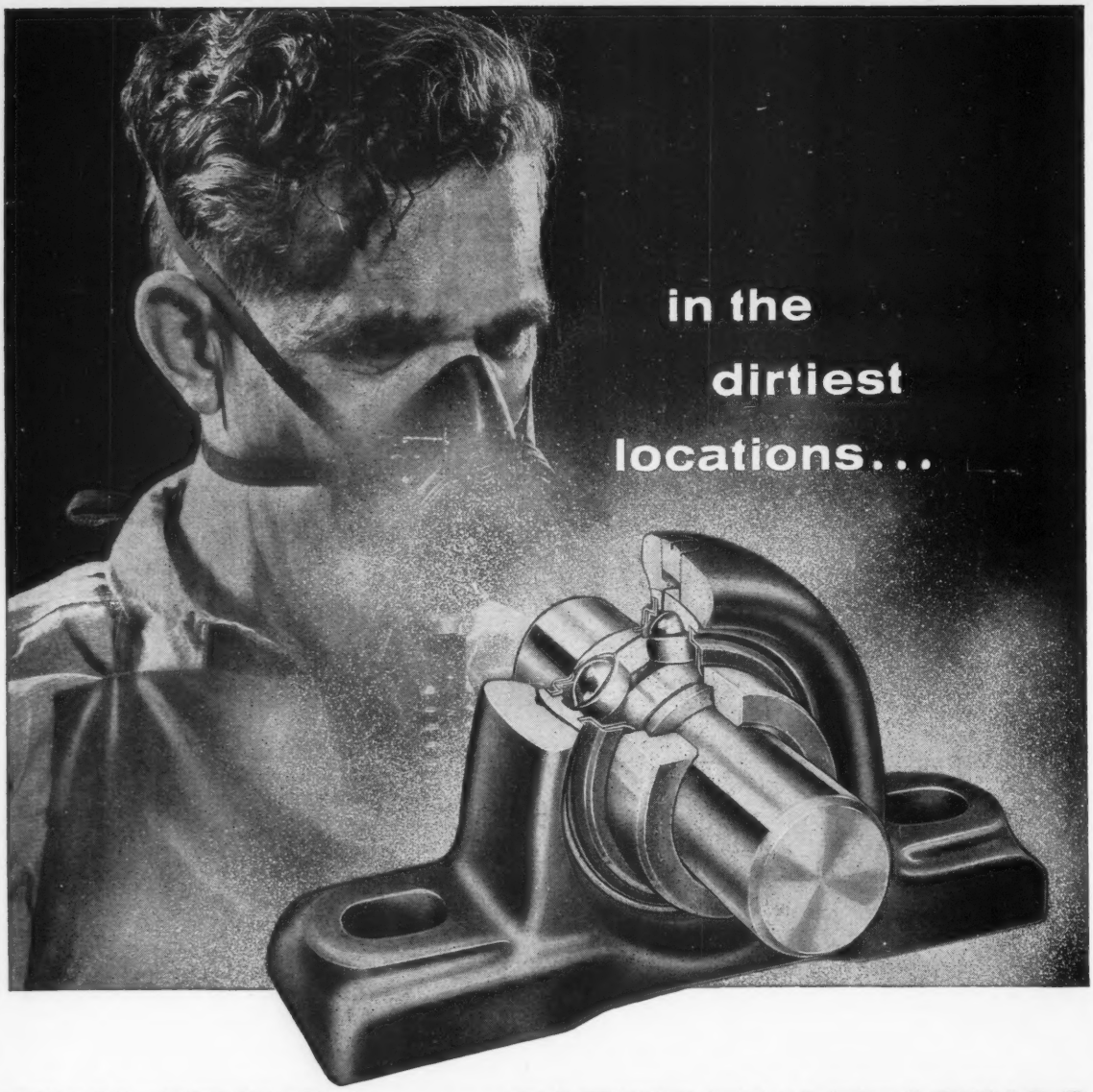
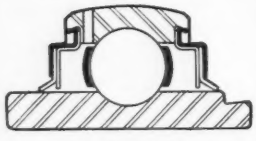


PLYA-SEALS* in new FAFNIR RAK BEARINGS shut out dirt even at very slow speeds



***PLYA-SEAL**

shown in this cross-section consists of a synthetic, rubber impregnated, sealing washer, sandwiched between two "dished" steel plates. Outside pressure from contaminants increases the seal's effectiveness as the flared lip tightens against its contact surface and against the innermost supporting plate.

New Fafnir RAK type pillow blocks incorporating Wide Inner Ring Bearings with Plya-Seals are *specially* designed for dirty operating conditions.

The contact type Plya-Seals offer many outstanding advantages: they effectively seal out contaminants at low speeds, while retaining their grease supply. Close clearance between inner supporting seal member and outside diameter of inner ring keeps seal from pushing in.

RAK Pillow Blocks with Plya-Seal Wide Inner Ring Bearings are dimensionally interchangeable with the famous Fafnir LAK Mechanical-Seal type pillow blocks available in popular shaft sizes from ½" to 2-15/16"; feature the exclusive Fafnir Self-Locking Collar which eliminates the need for lock nuts, washers, shoulders, sleeves and adapters.

For full details, contact: United Steel Corporation Limited, 58 Pelham Avenue, Toronto 9.

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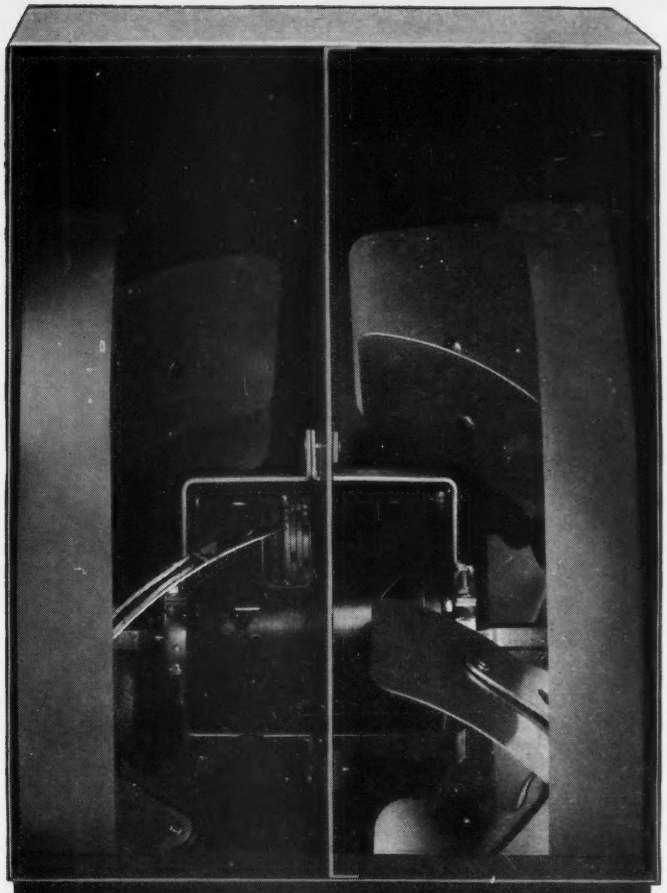

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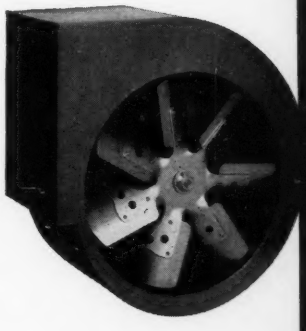
IT'S THE GREAT NEW TORRINGTON MIXED-FLOW RADIAX ▮ 6 SIZES FROM 300 TO 3000 CFM ▮ SAVINGS UP TO $10 PER UNIT ▮ SIZE, WEIGHT AND MOTOR ECONOMY ▮ PLUS TORRINGTON REPUTATION ▮ FULL DETAILS AND ENGINEERING SERVICE ON REQUEST



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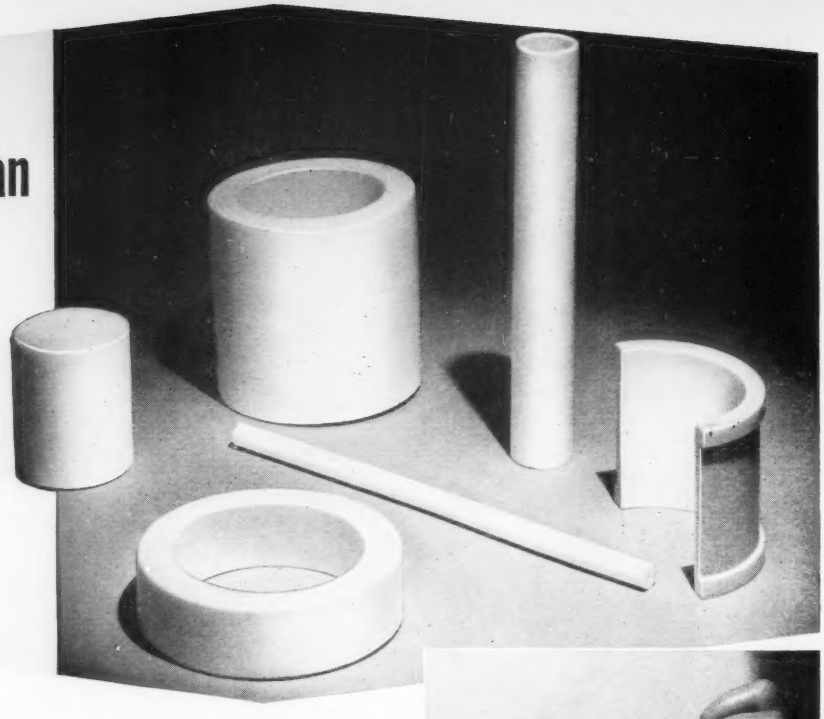
First Canadian Production of "TEFLON" Rods and Sheets



Manufactured in Canada by Jos. Robb & Co. Ltd., 5575 Cote St. Paul, Montreal.

The new facilities at the Robb Company plant provide for ram extrusion of rods and tubes in diameters from one-half inch to two inches. In sheet form the "Teflon" is pressed and baked to sizes up to three feet square. The rod, tube and sheet production has been added to existing company moulding operations.

The unique qualities of "Teflon" tetrafluoroethylene meet hundreds of special needs in Canadian industry.

FRICTIONLESS BEARINGS
For the automotive industry, thanks to "Teflon" 's low co-efficient of friction.

GASKETS, PACKING RINGS, VALVE FITTINGS
For the chemical, petroleum and papermaking industries, thanks to "Teflon" 's immunity to chemical corrosion.

MACHINERY
In the baking and packaging industries, thanks to "Teflon" 's "anti-stick" properties.

INSULATION IN WIRE, CABLE AND GENERATORS
In the electronics industry, thanks to "Teflon" 's high dielectric strength and low loss factor, even at high temperatures.

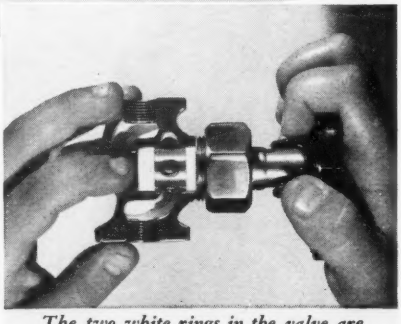
SANITARY EQUIPMENT
In the food, dairy and beverage industries, thanks to "Teflon" 's freedom from contamination.

JET AIRCRAFT PARTS
Thanks to "Teflon" 's heat-resistance . . . resists temperatures as high as 500°F and as low as minus 450°F.

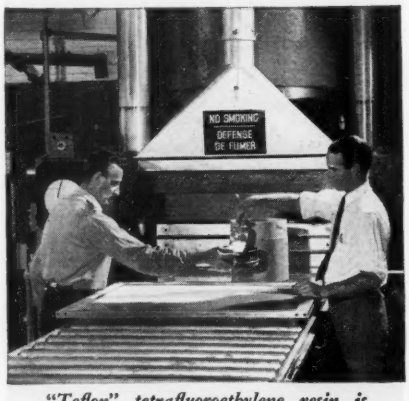
The special qualities of "Teflon" can help you, too. For technical information contact your Du Pont of Canada representative or write:

DU PONT COMPANY OF CANADA (1956) LIMITED
Chemicals Department, P.O. Box 660, Room A-4, Montreal, Que.

For supplies of Canadian-made sheet, rod or tube "Teflon", contact your local representative of Jos. Robb & Co. Ltd., or Anchor Packing Co.



The two white rings in the valve are made of "Teflon" plastic and provide extreme resistance to corrosion by chemicals as well as low co-efficient of friction.



"Teflon" tetrafluoroethylene resin is shown being prepared for pressing into sheets. Later the sheets will be engineered into gaskets, packing rings, and scores of other specialized products.

LET "TEFLON" BRING NEW EFFICIENCY TO YOUR OPERATIONS — *DEPENDABLY, ECONOMICALLY*

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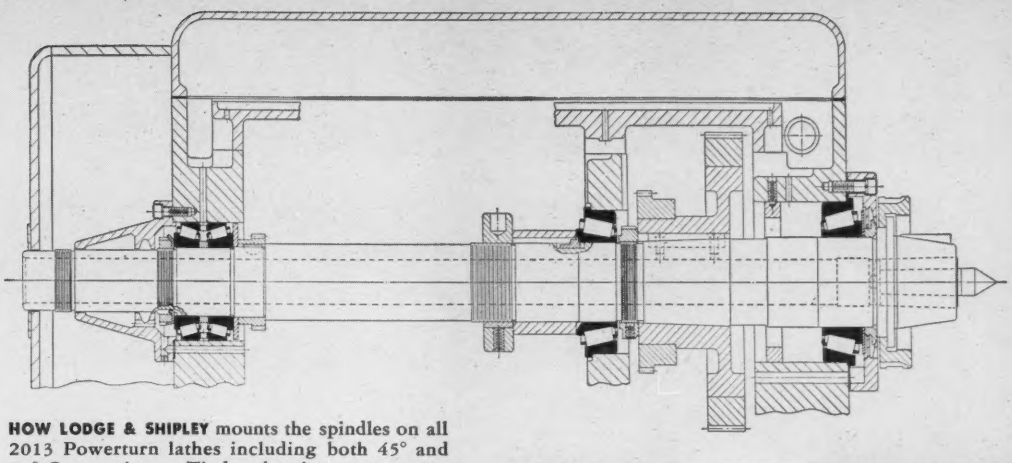
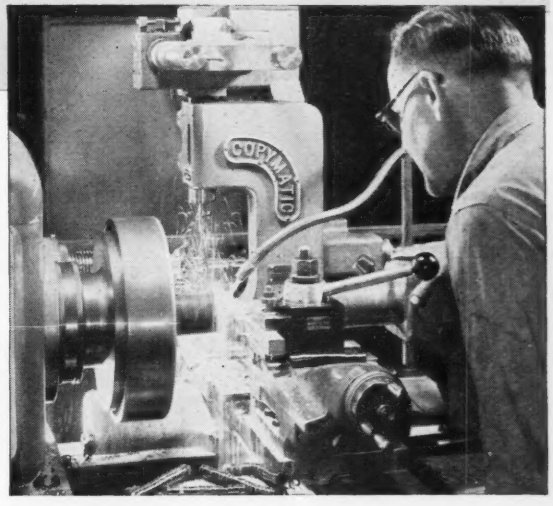


HOW LODGE & SHIPLEY mounts the spindles on all 2013 Powerturn lathes including both 45° and 90° Copymatics on Timken bearings to get extra rigidity, maintain accuracy, reduce maintenance.



New type lathe ups production 200%, saves users an estimated $8,000 a year

...one secret—TIMKEN bearings on the spindle

"Production increases as high as 200%"..."Overall savings estimated at $8,000 a year"—read user reports about the new 2013 Powerturn 90° Copymatic Lathe. One important reason for such exceptional results is that Lodge & Shipley mounts the spindle on Timken tapered roller bearings. Timken bearings give it the vital extra rigidity and hold runout to the minimum needed for tracer accuracy.

How spindle is held rigid. Timken bearings hold the spindle in positive alignment. They take *both* radial and thrust loads in any combination, because of their tapered design. And because of full line contact between rollers and races, Timken bearings have extra load-carrying capacity.

Why heavy shocks are absorbed. Case-carburization of Timken bearings' rollers and races gives them hard, wear-resistant surfaces and tough, shock-resistant cores.

How friction is virtually eliminated. Timken bearings are geometrically designed to roll true. And they're precision-made to live up to their design. They run smoother—last longer.

We even make our own electric furnace fine alloy steel, for extra quality control. To get all these advantages, always specify bearings trade-marked "TIMKEN". The Timken Roller Bearing Company, Canton 6, Ohio, U.S.A. **CANADIAN PLANT:** St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

TIMKEN *Made in* **CANADA**

TRADE-MARK REG. IN CANADA AND U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

FOR CANADIAN INDUSTRY

NOT JUST A BALL ○ NOT JUST A ROLLER ⊂⊃ THE TIMKEN TAPERED ROLLER ⊂⊃ BEARING TAKES RADIAL AND THRUST →←LOADS OR ANY COMBINATION

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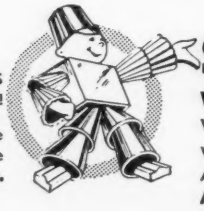
Standard Tube, the largest fabricator of welded steel tubing in Canada, is ready to give *you* a complete tubing service from single tubes to complicated fabrications. To ensure constant high-quality tubing, Standard Tube maintains a completely equipped laboratory to make continuous product tests . . . ranging from raw stock analysis to searching examination of in-use operation of finished units. If you are designing new products or improving existing ones, let Standard Tube work with you.

STANDARD TUBE STANDS FOR ALUMINUM TOO!

Sheet, Bar, Extrusions, Tube and Wire—available in any quantity.



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Member of Formed Steel Tube Institute

H 8458

New plastic in round pellets

From washers to table doilies we find tenite polyethylene

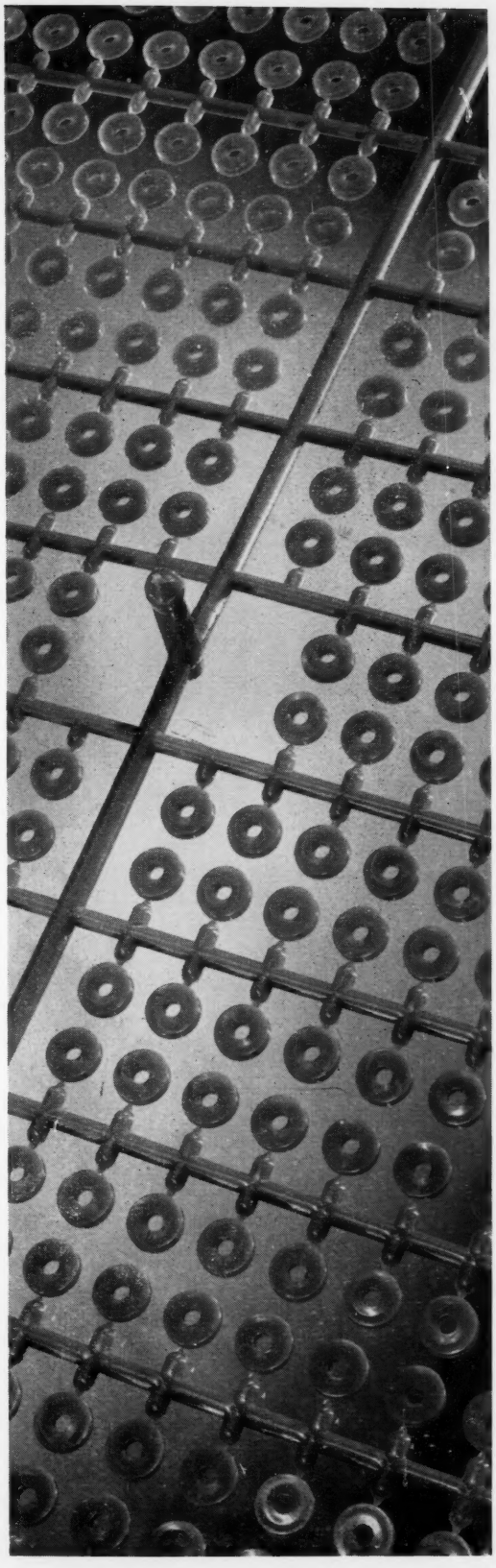
Tenite polyethylene is an improved polyethylene made in spherical pellet form by Eastman.

Its desirable properties make it a material to consider for many applications. It is available for injection molding, blowing or continuous extrusion in a wide variety of colors.

The material is light in weight, tough, strong and resilient. Its resilience simplifies mold and core design, permitting undercut parts to be stripped easily from cores. It is tasteless and odorless.

Chemically inert, it resists the attack of salt water, strong acids and alkalies. It will not support mold growth and is resistant to bacteria and fungi. At room temperatures there is no known solvent for this plastic.

In addition, the material has the advantage of being in spherical pellet form. Spherical pellets ensure better flow and reduce "bridging" during molding. Their smooth, unbroken surfaces provide no place for dust to settle in. Their lower bulk saves up to 10% in shipping or storing space. And, because there are fewer "fires," molders can clean hoppers quickly when changing colors. In addition, Tenite polyethylene gives unmatched color quality, good color dispersion and a finish that is amazingly glossy for polyethylene: one, in fact, that approaches the smooth, lustrous surfaces obtained with plastics of much greater inherent hardness.



Washers

Three hundred washers at a time are formed of red Tenite polyethylene by rapid injection molding for use as seals in Ray-O-Vac pencil-size batteries. The unusual flow properties of the material make possible this multiple molding job at the rate of over 100 castings (some 30,000 washers) an hour. The small, circular pieces strip easily from the over-all casting when it comes from the mold.

The polyethylene washers serve as closing members for the dry cell batteries. In assembly, a washer is applied by force fit over a brass-capped central carbon stick, to effect a tight seal around it. The perimeter is then sealed by crimping the cell's zinc cap over the outer edge of the polyethylene piece.

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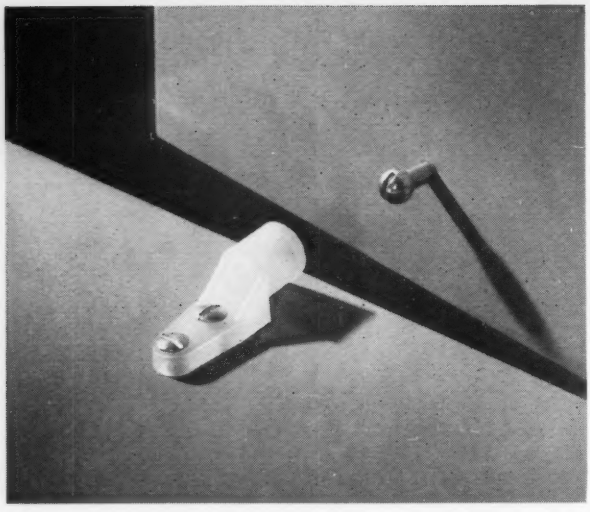
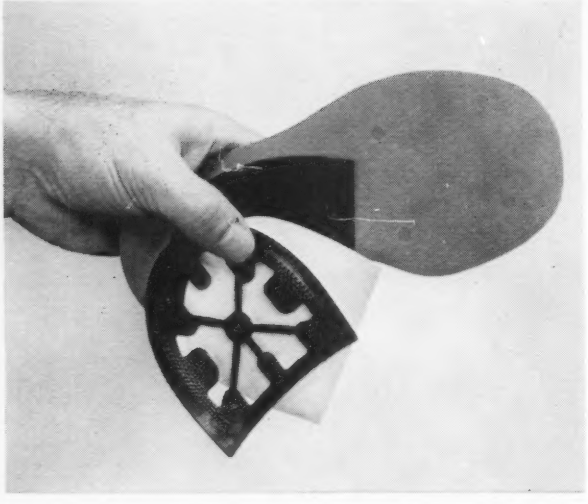


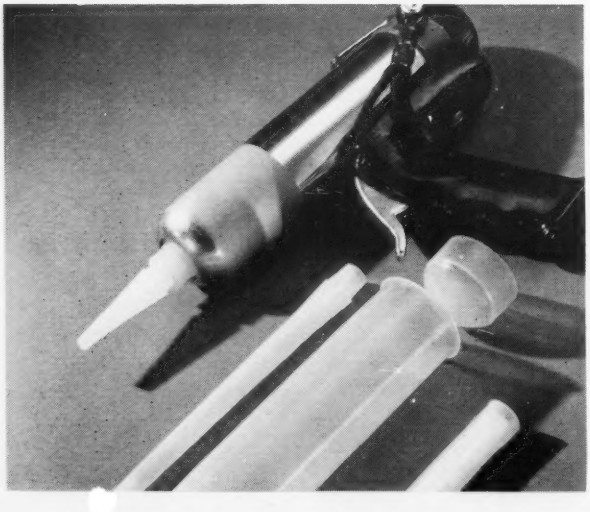
Door catch

New friction catches hold cabinet doors tightly closed. The working part of these catches is a cup-like molded polyethylene piece which fastens to the cabinet shelf. As the cabinet is closed, the cup slips over a rounded screw fixed in the door and grips it firmly by friction fit. Resiliency and toughness of the polyethylene enables the cup to hold its shape and friction power throughout long use. The catches are smooth and noiseless in action.



Shoe heels

An important factor in the use of polyethylene (instead of conventional raw materials) for these Dutchman heel pieces (centre), midsoles (top) and heel bases (bottom), is that the plastic can be supplied in formulations that embody the precise qualities desired by the shoe manufacturers, including color.



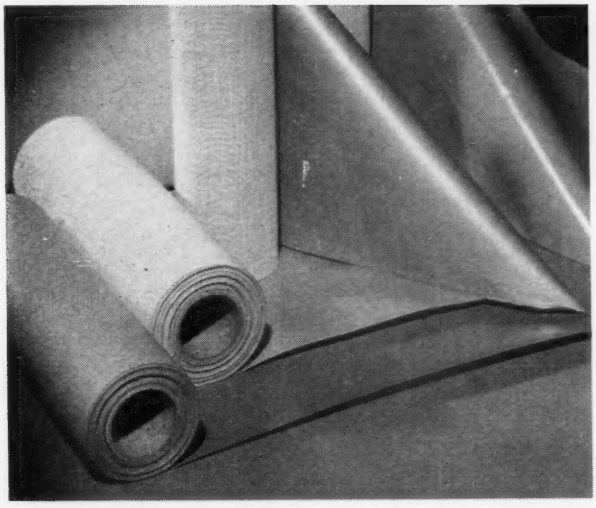
Cartridges and nozzles

A new sealant gun, designed to speed sealing operations in aircraft and other assembly work, uses disposable cartridges and nozzles molded of polyethylene.

Cartridges containing the caulking compound fit into the gun barrel. Threaded nozzles (available in a variety of sizes and shapes) screw into the front end of the cartridges. A press of the trigger turns on air pressure, causing the sealant to extrude smoothly and automatically. When the supply of sealant is exhausted (or the job is completed) the polyethylene parts can easily be discarded, to eliminate cleaning time and costs.

TV shield

This large shield molded of polyethylene surrounds an RCA color television picture tube. The material was selected for three reasons. Its high dielectric strength enables it to insulate against 25,000 volts. Its resilience cushions the tubes against mechanical shock during storage and handling. And because it is easy to mold, the large complex shape of the shield presented no problem to the fabricator.



Paper and cloth

To the natural characteristics of paper and cloth, the colorful polyethylene coating adds excellent moisture and grease resistance. Coated surfaces are also exceptionally easy to clean. The color possibilities in Tenite polyethylene are, moreover, practically unlimited, so there is a wide selection open for specific end-uses.

The new coated materials are available in rolls.

Cartridge boxes

Ammunition stays clean and dry in new Amm-O-Safe cartridge boxes molded of polyethylene. Designed for hunters, match shooters or hand-loaders, the cases hold shells in individual shock-resistant compartments. The tough, resilient plastic wears indefinitely, eliminating the old problem of torn boxes and collapsed partitions.

The boxes are made in bright red for easy visibility in the field or on the range, and can be readily cleaned in soap and water. They are in three sizes, with a slip-on plastic cover.

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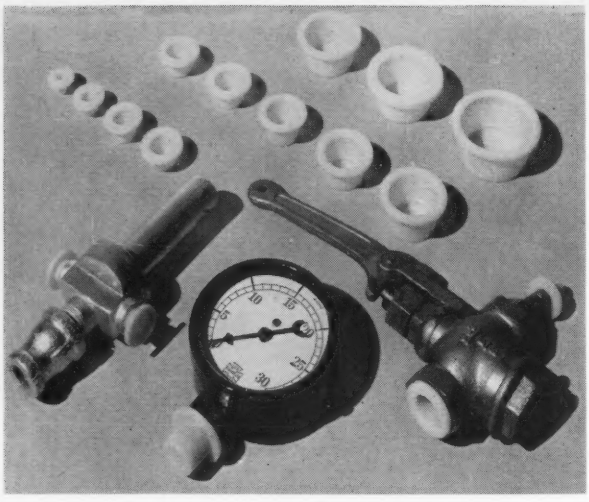
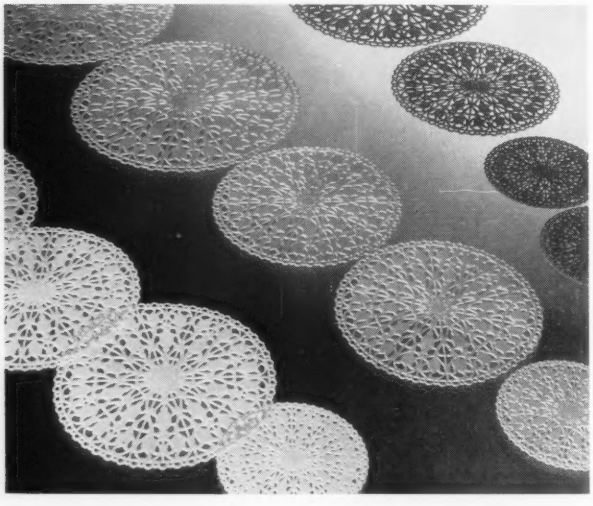


Thread protectors

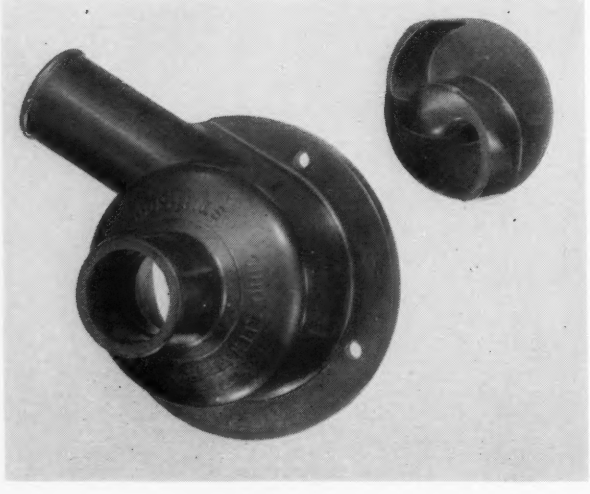
New caps molded of the material give threaded parts effective, low-cost protection against dust, dirt and damage. They serve either as caps over external threads in a machined part, or as plugs to protect internal threads during assembly, shipment or storage. The net result is to put the part in the hands of the user in factory-inspected condition.

The resilient caps are made in lustrous green or yellow. They come in sizes and styles to fit all threads and openings.



Doilies

Molded of flexible white Tenite in a lacelike design, these doilies are delicate in appearance but will wear indefinitely and are easily wiped or washed clean.



Plastic pump

Two plastic moldings (and a small stainless steel shaft) form this compact, efficient, long-lasting pump. It's a pump that cuts costs for both maker and user. Inexpensively molded of polyethylene, it is simple to fabricate, assemble and attach to an electric motor.

Because the material is highly corrosion resistant and chemically inert, pumps like this solve many tough jobs for users. For example, on vending machines, they are handling beverages without impairing the delicate flavor or color. In washing machines and other household appliances, they are showing long life, despite daily exposure to the corrosive attack of detergents and alkali. In photo-developing units, the pumps are handling water, hypo and acid solutions without affecting sensitive photographic fluids or emulsions. In still another application they handle anti-freeze at minus 80 F.

Rubber-to-metal weld

Birth of new flexible coupling family

Flexible rubber couplings are available for any set of conditions

When applied to couplings, the resilience of rubber permits misalignment, absorbs torsional vibration, reduces noise in the transmission system and smooths out torque irregularities.

Full use of the properties of rubber is made possible by the **Metalastik** rubber-to-metal weld and to meet the problems associated with power transmission this company has developed a family of flexible couplings. The rubber-to-metal weld is common to every member of the family but the designs (which emphasize one or another characteristic) vary widely so that a suitable coupling is available for any set of conditions.

The trailing link coupling (Fig. 1) has been developed to accommodate an exceptional amount of parallel misalignment without power loss. Permitting angular misalignment and end float, it is manufactured in a range of sizes to transmit 1-20 hp at 100 rpm. A single trailing link coupling will replace a long cardan shaft assembly.

The double cone type (Figs. 2 & 3) is very flexible torsionally to eliminate torsional vibration and absorb shock loads. It transmits thrust and is available for drives of 10 to 140 hp at 100 rpm.

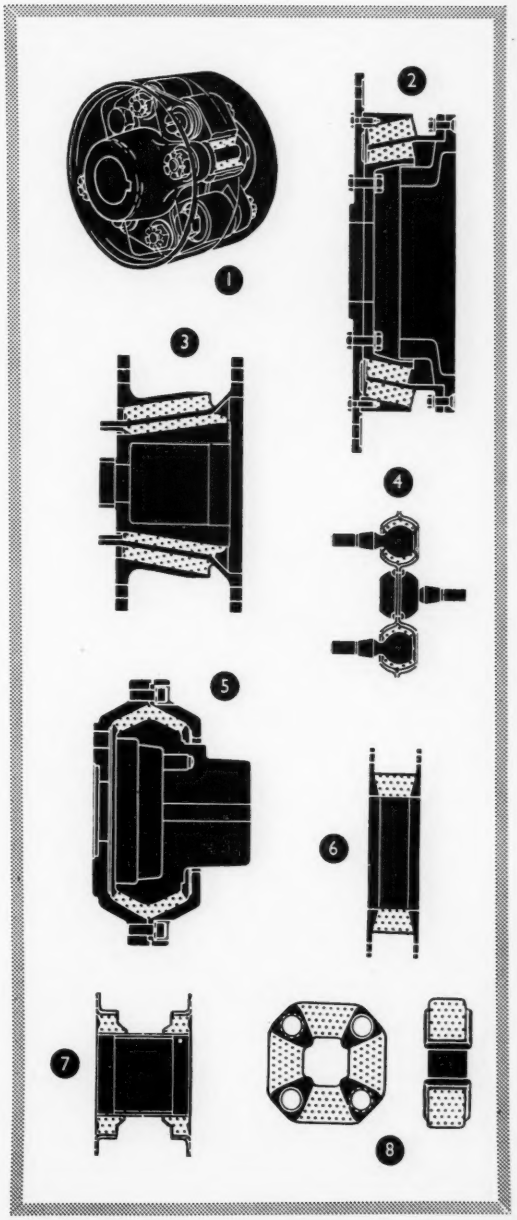
Universal couplings (Fig. 4) accommodate a large amount of angular misalignment with very low resistance and come in sizes to transmit 0.3 to 3 hp at 100 rpm.

Specially designed for marine drives (but suitable for other applications) the bicone coupling (Fig. 5) transmits thrust, absorbs torsional vibration and accommodates misalignment. It is available for drives of 5 to 10 hp at 100 rpm.

In various designs to transmit from a fraction of one horse power to 4 hp at 100 rpm the Metalastik vee-type coupling (Fig. 6) has high torsional flexibility to absorb shock and damp vibration. A useful amount of misalignment is accommodated.

Fig. 7 shows two ultra-duty bush couplings connected by a short shaft. This arrangement permits a high degree of torsional flexibility and provides for shock loads, torsional vibration and angular misalignment. For most applications in which the design can be employed to advantage, a single coupling is sufficient. Ultra-duty bush couplings are available in sizes to transmit 0.75 to 18 hp at 100 rpm.

As much as 22 deg. angular misalignment can be accommodated by the coupling of the Rotoflex type shown in Fig. 8 (plan and section). This coupling is fitted in the steering column of production automobiles and is valuable for many other applications in which a large degree of universal movement with shock absorption is required. These couplings are available to transmit 5.5 to 42 hp at 100 rpm. ★



Brief report on seven

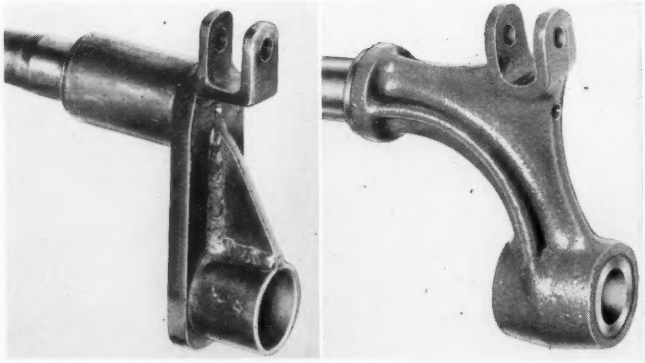
cases where

redesign using

castings paid off

Castings in redesign - case histories

1



1(a) left
1(b) right

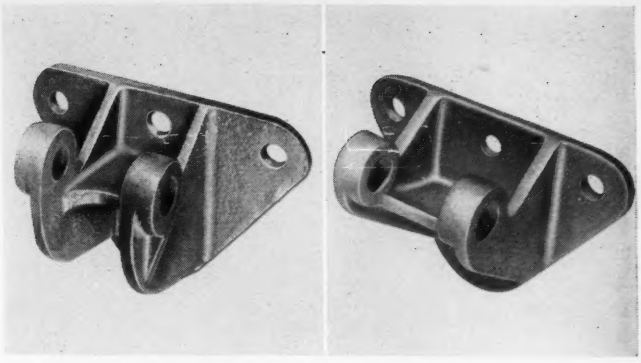
Fig 1 (a) shows a welded component which suffered from poor appearance and insufficient strength.

It was considered that a steel casting would be practical since quantities were too small to afford forging dies and too large for economical production by welding. As a one-piece steel casting, the appearance of the part would have to be corrected to obtain the necessary strength.

Excessive machine stock must be eliminated and the part must be easy to machine in semiproduction quantities.

Fig 1 (b) shows the part redesigned as a steel casting that can be made rapidly from relatively inexpensive pattern equipment. "Eye appeal" was achieved and the cost reduced by 28%. The steel casting has the metal distributed where of most value.

2



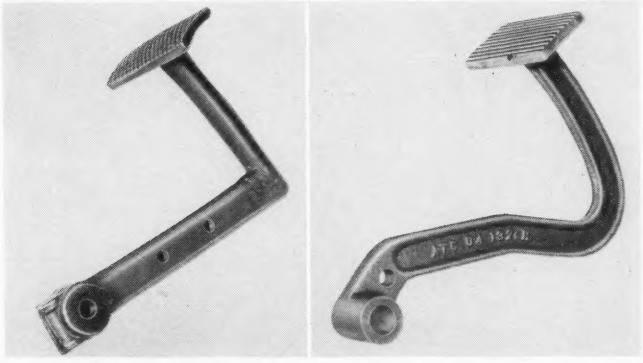
2(a) left
2(b) right

This cast steel hinge butt was too expensive to produce as originally designed. The number of cores required when the bosses were on the outside added greatly to production costs.

The cored hinge-pin holes must be in line and parallel with the triangular shaped base. The load on the casting was such that the internal and external ribs were in bending and not in direct tension or compression.

The redesign [Fig 2(b)] reduced the weight from 12.2 lb to 9.8 lb. The bosses were placed on the inside (thereby eliminating two cores) and reducing the cost as well as improving the appearance.

3

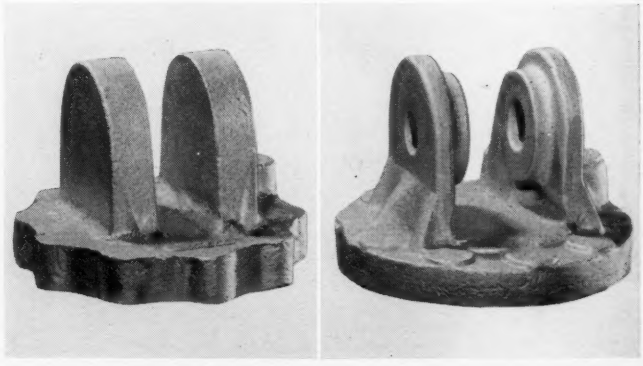


3(a) left
3(b) right

By welding together a forging, a stamping and a steel tube Fig 3(a), this clutch lever cost too much to produce. Its dimensional stability could not be maintained and it had a poor appearance. It also lacked strength and did not have good machinability. The redesigned component in certified malleable iron [Fig 3 (b)] can be produced more economically and dimensional stability is assured. The part also has clean, flowing lines.

The casting process permits distribution of the metal to points of high stress, thereby providing the necessary margin of strength. The machinability is good with malleable iron and the total cost of the part is reduced by 19.3%.

4



4(a) left
4(b) right

The design of the cast steel cylinder head shown in Fig 4 (a) caused a shrinkage condition at the base of the lugs that the foundry could not control consistently.

In the modified design [Fig 4 (b)] the increased metal section toward the outer rim permits the metal to solidify progressively from lugs to rim to feeding risers, thus eliminating the shrinkage condition. Location of the feeding risers was a major consideration in overcoming the shrinkage condition. By redesign, the total cost of the part was reduced by 9.4%.

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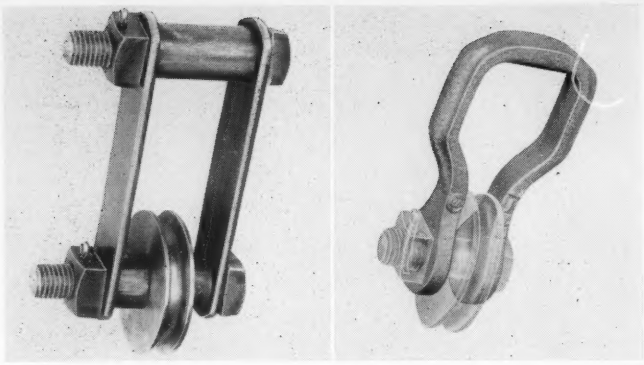
5



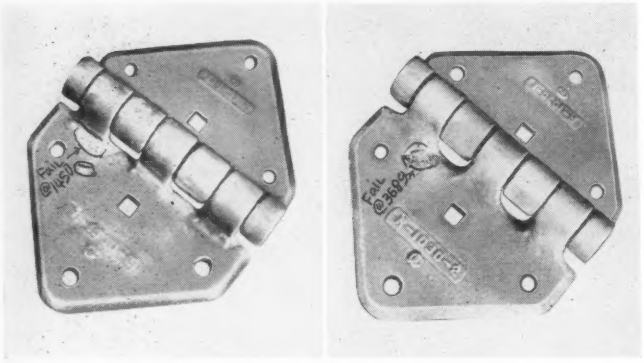
5(a) left
5(b) right

As originally designed [Fig 5 (a)] this clevis lacked eye-appeal. The fact that twelve pieces were required for each complete unit caused excessive handling, machining and assembly and made the part expensive to produce. In addition, because of its design and shape, the unit frequently failed to function properly. It weighed 3 lb 11 oz.

A one-piece malleable iron casting was used in the redesigned part [Fig 5 (b)] and the smooth, flowing lines improved the appearance.

The redesign resulted in a lower production cost per unit: only five pieces per unit are required.

6



6(a) left
6(b) right

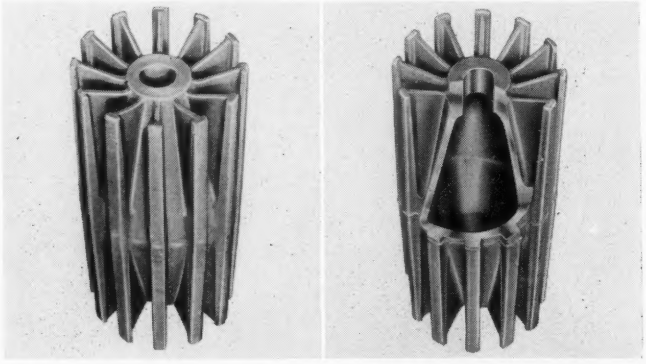
The conventional design of Fig 6 (a) had critical stress concentration and a load-carrying capacity of 1,450 lb which was inadequate for service requirements. The part was dimensionally unstable and conducive to poor quality.

The redesign of Fig 6 (b) took advantage of the casting process and developed a proper shape for improved function, strength and castability. Based on the results of experimental stress analysis, it required the addition of only a few ounces of metal at strategic points.

The redesign also reduced the stress concentration 65.9% and gave a uniform stress distribution.

The part now has a load carrying capacity 2.5 times greater and it is dimensionally stable.

7



7(a) left
7(b) right

This 380 lb cast steel conveyor belt pulley was originally designed as a one-piece casting [Fig 7 (a)] making it difficult and expensive to produce. The casting could not be gated and risered so as to ensure sound castings.

The costly large centre core could not be properly anchored to give dimensional stability. Also, occasional cracking of the casting occurred during production.

The redesign of Fig 7 (b) casts the pulley in two halves which are welded together into a single unit on assembly.

Metal powder makes power saw parts

Powder metallurgy is a practical way to manufacture these saw parts

After examining other methods of fabrication, engineers at Porter-Cable Machine Company designed their bayonet power saw (Model 548) drive block and bearing retainer slide for manufacture by powder metallurgy. At first, the use of bar stock was considered for the bearing retainer slide, but the machining of the part and broaching of the central rectangular hole would have been too expensive. A stamping from sheet metal was also considered, but manufacturing difficulties made it necessary to abandon this idea. After consulting with a custom fabricator, it was decided that the most practical method was to make them from metal powder.

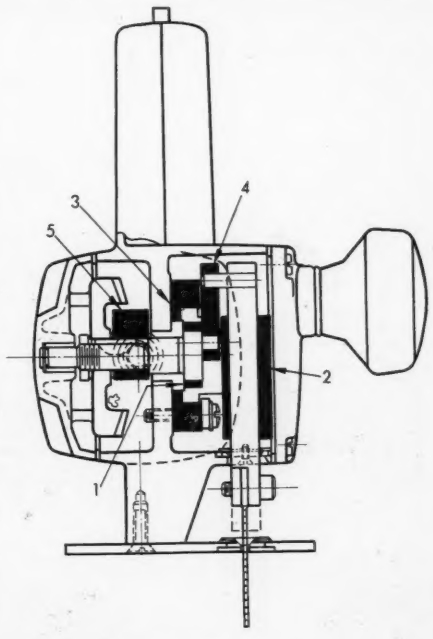
Made of high density iron, the central rectangular hole of the bearing retainer slide is pressed to size, producing a sliding fit with the drive block. After grinding, the slide is case-hardened to a depth of 0.008 to 0.013 in. The drive block is made from bronze powder pressed to fit the bearing retainer slide, and then oil-impregnated for lifetime self-lubrication, an essential feature of this type of equipment. Self-lubrication cannot be achieved by any other production process.

Vital to the orbital motion mechanism of the bayonet saw is the blade holder saddle, which forms the bearing face for the blade holder. Pressed and sintered from steel alloy powder (and then steam-treated to develop a black oxide finish) this part supports four needle bearings, which in turn form the support for the blade holder. As supplied by the fabricator, the blade holder saddle has a counterbore 0.990-1.000 in. diameter by 0.281-0.286 in. deep. Four holes (molded in by the fabricator) are reamed to size. An oil-impregnated bronze powder blade holder cover acts as the outboard bearing support for the four needle bearings that guide the blade holder. Oil-impregnated bronze powder parts are also used for both the upper and lower drive mechanism retainers. In the assembled mechanism, these parts form bearing surfaces and retainer plates for moving parts, providing lubrication and easy assembly.

At the heart of the operation of their electric hand saw (Model 152) is a group of sliding parts that generate the orbital motion of the blade. A blade holder saddle slides in a retainer and a drive block fits into the saddle. Because self-lubrication and close tolerances are required for the blade holder saddle, powder metallurgy methods proved to be the best way to make this part. The saddle is, in fact, a steam-treated, oil-impregnated iron alloy part. The campanion parts (the saddle retainer and drive block) are made from bronze powder, oil-impregnated.

A copper-infiltrated iron powder counterweight is used to balance the orbital-motion-producing mechanism in the hand saw. Powder metallurgy was chosen to avoid high cost of machining or investment casting.

Critical components used in conjunction with the power source of the hand saw are powder metallurgy parts. One of the most important of these is the link drive that connects the power source to the blade. This oil-impregnated part is made of an alloy steel powder, case-hardened. The pinion bearing (used on the armature shaft) and the main and end bearings on the drive shaft are oil-impregnated bronze powder parts. ★



Electric hand saw model 152

(1) is an oil-impregnated drive block driven by an eccentric shaft and riding in the blade holder saddle (2) made from oil-impregnated powdered iron. The travel of this drive block gives a relief action to the saw blade, so that the teeth work only on the cutting stroke.

These two parts are carried in a powdered bronze saddle retainer (3) which also carries the blade holder. A cast steel alloy drive link (4) imparts a vertical reciprocating motion to the blade and holder. Two powdered bronze retainers are used to clamp the saddle retainer to the main frame. (5) is a powdered iron alloy counter-balance mounted on the shaft.

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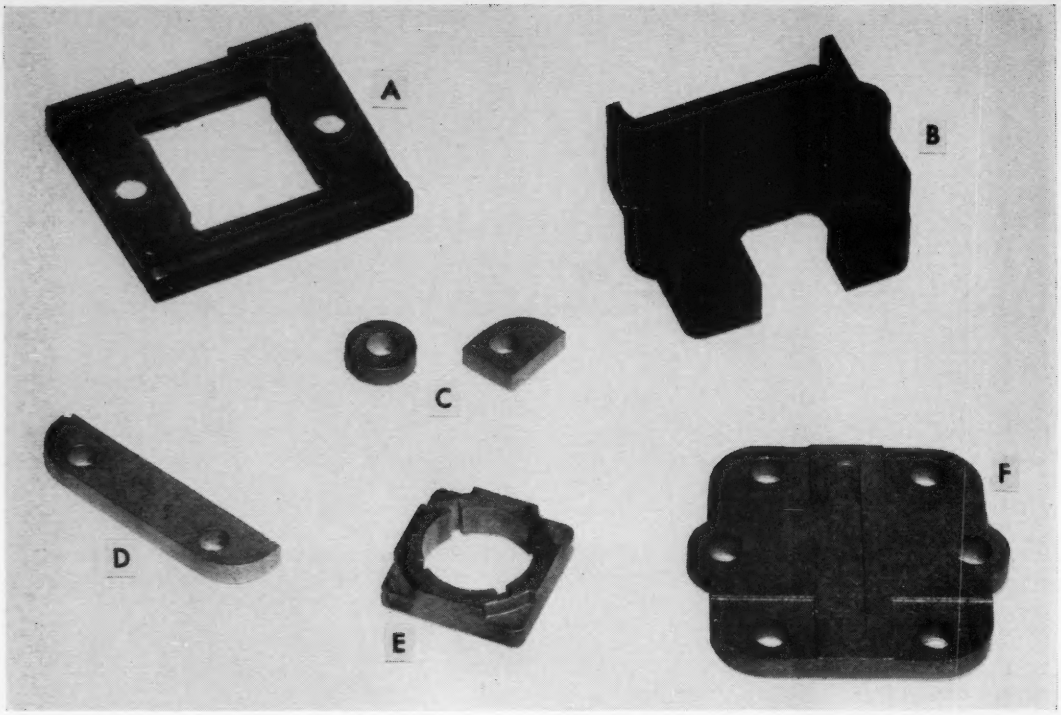
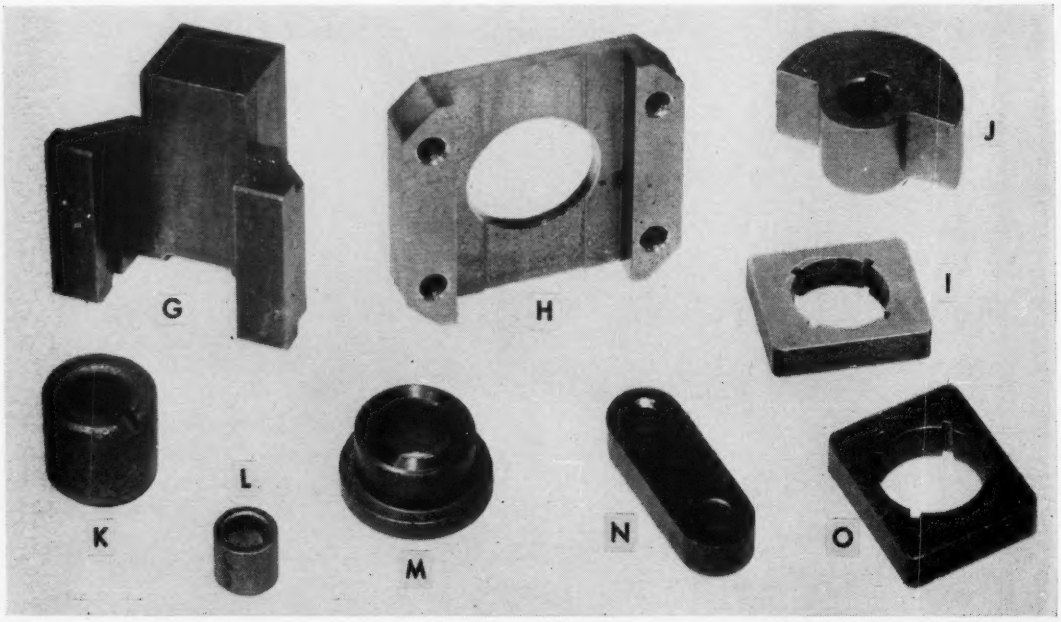
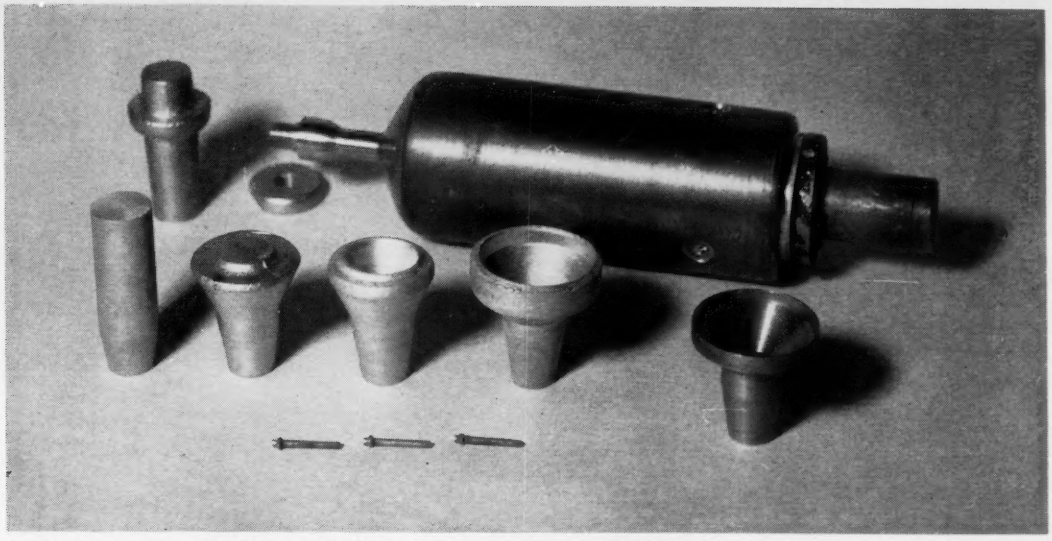


Powder metallurgy components of the Porter-Cable model 548 bayonet saw. (A) Drive block made of high density iron; (B) oil-impregnated blade holder saddle made of iron alloy powder: (C) and (D) upper and lower drive mechanism retainers are oil-impregnated bronze parts; (E) oil-impregnated drive block made of bronze powder; (F) cover used to retain blade holder made from bronze powder and oil-impregnated.



In the model 152 electric hand saw, these powder metallurgy parts are used in the blade actuating mechanism. (G) blade holder saddle that generates orbital action, made of iron alloy powder; (H) oil-impregnated saddle retainer made of bronze powder; (I, O) drive block made from oil-impregnated bronze; (J) counter-weight made from copper-infiltrated iron; (K) oil-impregnated bronze bearing; (L) bushing used on pinion end of armature shaft and main drive shaft bearing; (M) end drive shaft bearing; (N) link drive pressed of steel alloy powder. This is case-hardened and oil impregnated.



1. Forgings from molybdenum rod: X-ray tube stem, above, magnetron cones in sequence of operation, below.

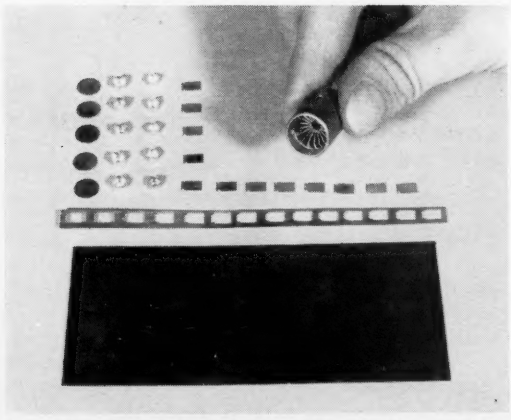
Electronic tubes of forged molybdenum

Experiments reveal uses for coated molybdenum in magnetron tubes

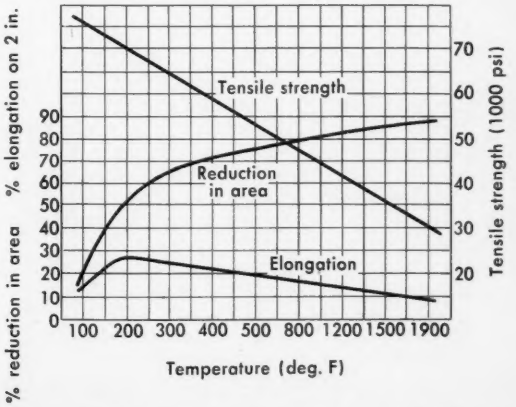
Many forged molybdenum components are found in electronic tubes. In some magnetron tubes, for example, forged molybdenum cones are used (see Fig 1). Forged stems for X-ray tubes are cast into copper rotors and later machined to finished dimensions, the forged and machined stems are threaded and tungsten targets are fastened to them with molybdenum nuts. Both the above forgings weigh approximately 45 gm. Identical methods are used to forge molybdenum rings 15 in. OD x 12 ID x 3½ in. high, weighing 150 lb. Blanks are cut from rods or bar stock and forged in tool steel dies at temperatures of 1,100 to 1,400 C.

Clad molybdenum has been used to fabricate electronic tube components for several years. In other components of electronic circuitry (such as transistors and rectifiers) molybdenum clad (or plated) with nickel has received much attention. Copper clad molybdenum is used as a magnetron component (see Fig 2). Rings are machined from cups drawn from the clad sheet, and assembled to the web structure, which is made up of sheet metal parts punched from clad strip. To make the copper clad components, molybdenum sheet is encased in high purity copper sheet, heated to 700-900 C, and rolled to finished dimensions. Heavy reductions are made on the first few passes to bond the copper to the molybdenum.

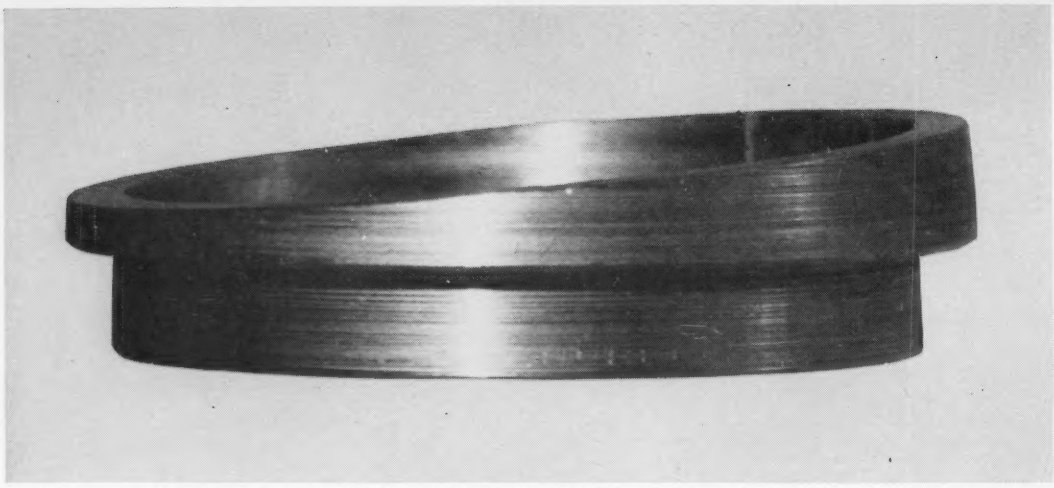
Experimentally, molybdenum is now being clad with other metals (such as stainless steel and Inconel) to provide oxidation-resistant surfaces on relatively large structural members in aircraft and elsewhere. ★



2. Tube parts from copper clad molybdenum sheet.



3. Properties of .4" di. of unannealed molybdenum rod.



1. An expanded-type alloy body seat ring of the 200 to 300 lb gate valve is shown above. Notice ring taper.

Gate valve redesign is now completed

An entire set of bronze gate valves has been streamlined to give greater strength, less bulk, along with other outstanding features

The re-design and modernization of the entire line of Crane Co. bronze wedge disc gate valves (begun several years ago) has now been completed. New style valves are available in the five pressure classes from 100 lb to 300 lb inclusive, in both rising stem and nonrising stem patterns.

A feature common to them is the cylindrical upper body re-designed for greater strength without bulk. It is of more rigid construction, with a modern appearance when installed in piping systems (see figs 2 and 3). It is, in fact, the basic shape long used in high-pressure steel valves to provide maximum reinforcement against line strains and the wedging action of the disc.

Another feature of the new bodies is the wide-face hexagon ends, which offer a wider, firmer wrench grip. These wide ends reduce the possibility of marring the hexagons when the valve is being installed. The longer hex also supports the body through the entire length of the pipe contact.

In addition to the cylindrical body, the nonrising stem valves in the 100-, 125- and 150-lb classes have a feature that further simplifies and strengthens them: the stuffing box now screws into (instead of onto) the bonnet. This construction provides better stem support, gives truer alignment of the stem and minimizes wear on the packing.

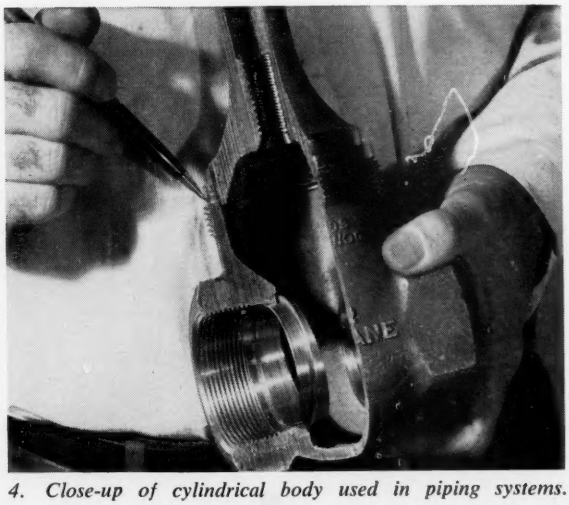
An outstanding feature of the 200 and 300 lb valves, (in both rising and nonrising stem patterns) is the expanded-type alloy body seat rings shown (fig 1). These seat rings are of wear-and-abrasion-resistant Crane Exelloy. The taper on them is accurately machined before they are inserted into the body. After machining, they are securely locked into position by expanding the projecting sleeve in an accurately machined recess in the body. The rings cannot loosen or leak in service. Normal seating wear on these valves is absorbed by the easily replaceable bronze disc. To facilitate replacement, the slot on the disc, and the head of the stem, are accurately machined. Two machined guide ribs on the disc travel in cast recesses in the body to ensure proper and accurate guidance of the disc at all times.

Valve operation safe-guarded

One of the problems with bronze gate valves of older design is the excessive entry of pipe threaded small to gauge (fig 4). This often springs the seats, so that discs either become locked in the closed position, or the valves cannot be closed tightly. In the new design, a shoulder has been added to the bottom of the thread in the port ends. This restrains the pipe from entering far enough to distort the seats and cause damage or interfere with valve operation. This is a good feature. ★

2. The wide-face hex ends offer a wider, firmer wrench grip.

3. The cylindrical upper body distributes pressure evenly.



4. Close-up of cylindrical body used in piping systems.

Valve redesign

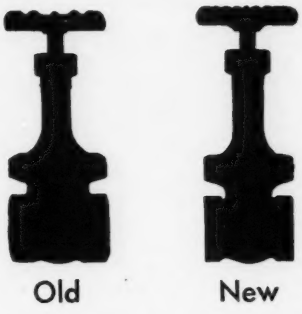


Fig. 1. In comparing the old body shape (left) with the new, notice the absence of the pinched effect in the new body design. The wider ends of the cylindrical body are in contrast to the narrow face of the old hexagon ends.

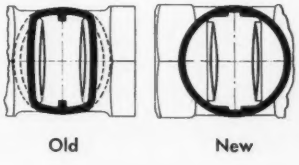


Fig. 2. Cylindrical design (right) distributes pressure load uniformly and resists distortion, with its possible seat leakage under higher pressures. In the old rectangular-shaped body, the stress was concentrated where the wall had its smallest radius.

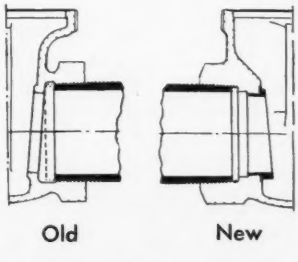


Fig. 3. To stop the pipe from damaging the valve seats, a shoulder is provided at the bottom of the thread in the port ends in the new design (right). In the old design, excessive entry of the pipe could cause damage to the valve seat.

Power-operated manipulators

This mechanical arm and hand out-manipulates its human counterpart

There is a demand for remote-handling apparatus when it is undesirable or impossible to employ a human operator. These conditions are found, for example, in certain chemical plants, where poisonous atmospheres or hazardous processes are involved, and in the nuclear energy field, where toxic or radioactive materials have to be handled.

Initially, cells for radioactive work were small and hand-operated manipulators were quite adequate for all general purposes. With the increasing radioactivity, size and weight of the items being handled, however, the need arose for larger, more heavily shielded cells. In such situations, hand-operated manipulators cannot cope with the heavier work required, and power-operated manipulators have therefore been developed to dismantle radioactive plant, position heavy specimens in specialized apparatus, and to operate hand and power-operated tools.

The G.E.C. power-operated manipulator (described here) is the mechanical equivalent of a human arm and hand, although it is, in some ways, capable of a greater range of movements than its human counterpart. The shoulder joint is mounted on a set of telescopic tubes suspended from a crab, so it has freedom of movement within a large working volume. The machine is controlled from a small console, positioned outside the viewing window or at some remote point, if closed circuit TV is available.

The principal requirements of such a machine are that it shall be compact, reliable and suitable for the ambient conditions. Since it may have to work close to large sources of gamma radiation, special attention must be paid to the design of all nonmetallic parts (such as electrical insulators, lubricants and paints), which may deteriorate under such conditions.

The compact design ensures that the operating headroom in the cell is kept to a minimum, that the necessary width of the shielding doors between cells is small, and that the manipulator does not foul or obstruct the operator's view of other items in the cell. These features represent distinct over-all economic advantages, since the extra construction costs of increasing the dimensions of the cell or the doors are very high. In addition, a compact, clean-lined machine is easier to decontaminate and to cover with protective bagging.

The need for reliability in a machine working in radio-active areas is self-evident, even though provision is made for removal of the manipulator from the area if there is a fault. Reliability also results in longer periods between overhaul, which are complicated by the need to decontaminate the machine.

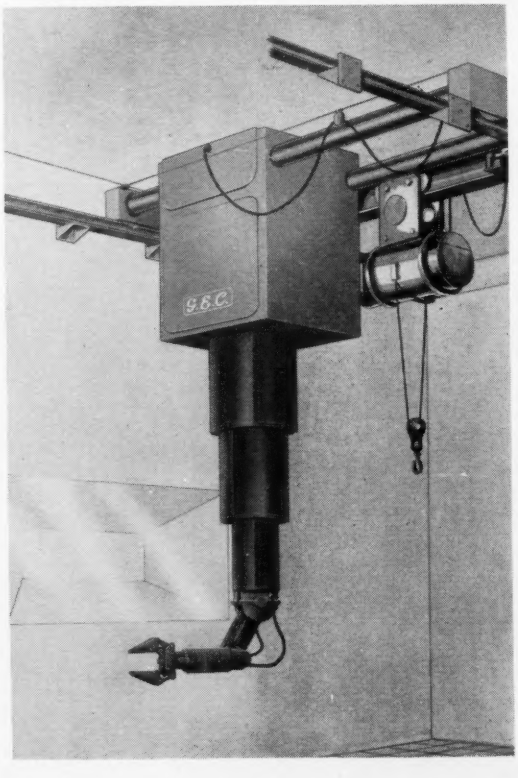
The manipulator (see Fig. 1) consists of a grasping device carried on a wrist, capable of continuous rotation. This is supported by a forearm, upper arm and shoulder. The arm joints are so designed that each section can rotate through 180 deg about its pivot, while the shoulder joint can rotate about a vertical axis.

The shoulder is mounted in the base of a set of vertical telescopic tubes, the upper section of which is rigidly fixed to a crane-type carriage. This carriage can be traversed across a gantry spanning the working area and traveling on longitudinal rails mounted near the top of the walls of the cell. The manipulator can thus be positioned anywhere over a large working area. The gantry also supports a 1½-ton electric hoist, with a cross-traverse parallel to that of the manipulator carriage. This hoist can be used for normal lifting duties and for supporting equipment on which the manipulator is working.

The telescopic tubes (which are housed in the carriage when in their stowed position) have a positive raise and lower action, the sliding movement between tubes being taken on anti-friction bearings running on stainless-steel paths. The driving motor for the tubes is mounted in the carriage.

The lowest tube houses three drive units, one for shoulder rotation, one for the shoulder pivot by which the upper arm is moved, and one for the elbow pivot

1. Manipulator in cell for radioactive materials.



Based on an article by D. J. Ingram and B. H. Stonehouse in the G.E.C. Atomic Energy Review. Published here by permission of Amalgamated Electric Corporation, Ltd.

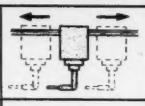
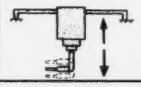
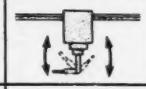
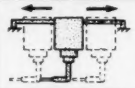
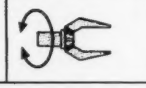
Left hand				Right hand			
Manipulator movement		Joystick movement		Manipulator movement		Joystick movement	
Long travel		Horizontal swing		Shoulder pivot		Horizontal swing	
Telescopic tubes		Vertical swing		Elbow pivot		Vertical swing	
Cross travel		in/out		Hand or hook grip		In-out	
Shoulder rotation		Handle rotation		Wrist rotation		Handle rotation	

Table 1. Table of manipulator movements with corresponding joystick movements.

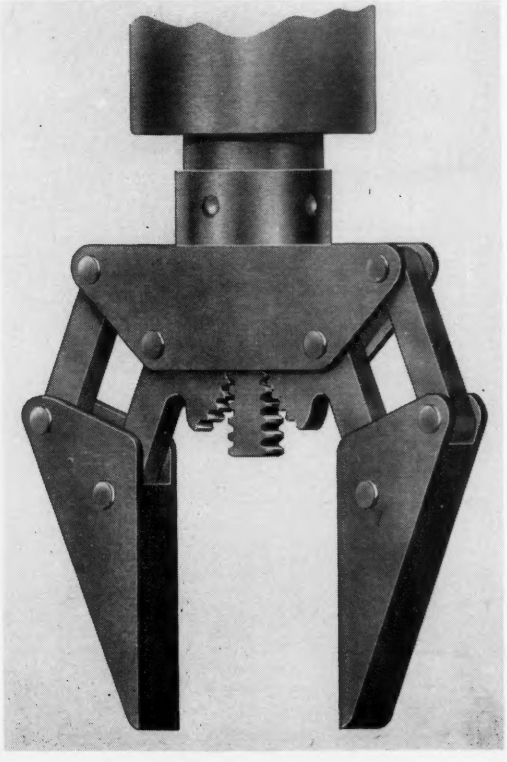
which controls the movement of the lower arm. The drives to the two pivots are transmitted through sets of gears mounted in the shoulder castings, followed, in the case of the elbow pivot, by a train of spur gears inside the upper arm. A 20-way slip-ring column (through which the electric connections to the rotating section of the manipulator are made) is also housed in the lowest telescopic tube.

Mounted on the lower arm are two drive units, one for the wrist (which gives continuous rotation in either direction) and the other for the grasping device. Two such devices are normally supplied. The more versatile of these takes the form of a hand (Fig. 2) with two jaws capable of a maximum opening of 5 in. The jaws are opened and closed by means of a parallelogram linkage driven by a rack, which is in turn coupled to the drive unit by a differential gear. The torque on the arm of this gear is used to provide an indication of the grip pressure applied by the jaws, a spring deflected by movement of the arm actuating a transducer.

The alternative device (which is used mainly for lifting duties) consists of a hook (Fig. 3) which can be driven against an anvil.

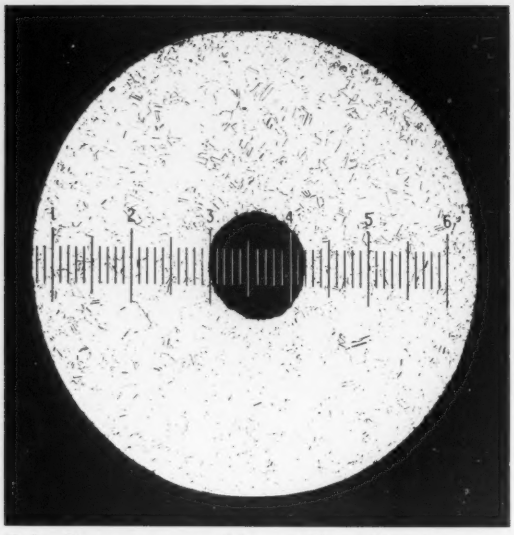
The grasping devices can be interchanged remotely.

2. Hand



3. Hook

Continued on page 80



Tube diameter measured by metallographic microscope.

Capillary tubing in longer lengths and various diameters

Greater uniformity among many advantages to new 3,000-ft. long tubing

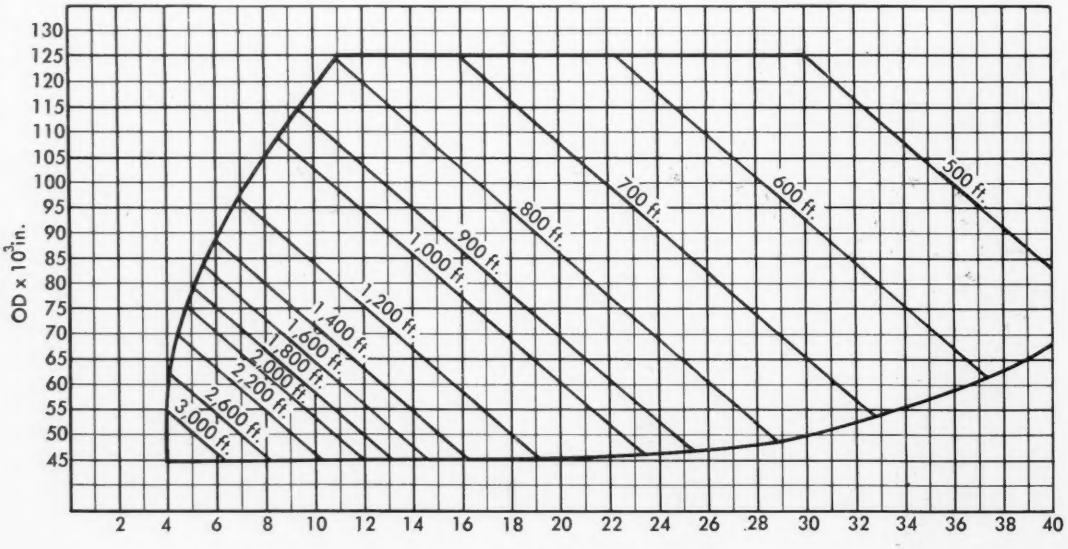
Capillary tubing up to 3,000 ft long is now being supplied by Superior Tube Company. Previously the maximum length was 500 ft. Advantages are:

- Greater uniformity than is possible when the tubing is not all drawn at the same time and different dies and mandrels are used. This helps instrument calibration.
- Possibility of using one continuous length of tubing from the sensing element to the indicating, recording or controling section of an instrument, even though the sensing element is distantly located.

The maximum length of tubing furnished depends on the inner and outer diameters specified. Maximum lengths for various diameters are shown in the chart.

Capillary tubing is usually of about 3/16 in. (or less) OD, with wall thicknesses generally greater than the ID. Most of the capillary tubing supplied by Superior is made from AISI types 304, 316, 321, 347 and 446 stainless steels, type C-1008 carbon steel, nickel, monel and inconel.

The tubing is furnished in random, multiple and cut straight lengths up to a maximum of 39 ft. Coils are furnished up to 3,000 ft long in coil diameters of 18, 24, 30 or 36 in. Extra long lengths are wound on reels. Tubing can be wound on customers' reels. ★



Nominal long length capillary tubing chart

1. Impact stresses that occur when a gun is fired are easily studied by the Stresscoat crack patterns on gun.

Stresscoat spray for stress analysis

A brittle coating air-dries to form a crack pattern under stress

Stresscoat is a brittle coating expressly developed to simplify and reduce the time and cost of experimental stress analysis.

It is an air-drying material that is sprayed on the part to be tested and allowed to dry. At the same time, a simple cantilever beam is sprayed and left to dry. This beam is used during testing to calibrate the Stresscoat so that quantitative strain measurements can be made.

After it has dried (in four to six hr) the part is loaded, and the coating observed for cracks. The crack patterns provide a clear presentation of the regions of high stress and indicate the relative stress concentrations on other areas of the part. The pattern shows the direction of the principal stresses and forecasts the location and direction of any potential failure. The stresses show up so sharply, in fact, that they are readily seen by shop men and other nontechnical personnel.

The method is in regular use on most types of solid material (all metals, glass, wood, plastics and others).

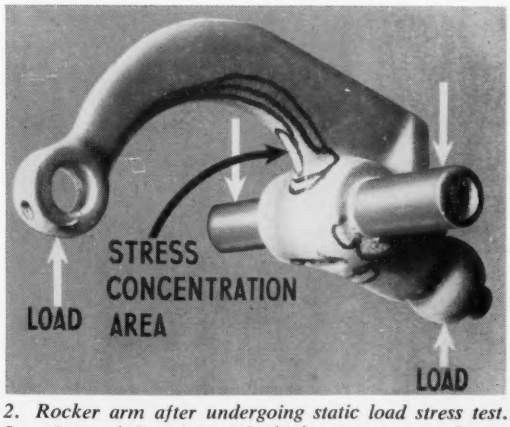
Usually, nothing is needed in the way of surface preparation, other than very careful solvent cleaning to remove traces of oil or other liquid. On rough-cast surfaces, a sand (or shot) blast is recommended to remove any sharp points, just as in preparing the surface for paint.

To show how the crack patterns actually appear with Stresscoat, fig 2 shows a rocker arm that was subjected to static loading to simulate actual service conditions. The location and direction of high stress are shown in the marked stress patterns.

The illustration on the cover shows crack patterns on a steel crane hook. Red dye etchant was used to make the patterns better seen.

Fig 1 is a dynamic test on a shotgun. It shows a dye-etched pattern of the cracks that occurred during the firing of a normal sized cartridge in a shotgun. The sensitivity of the coating in this test was such that all areas with cracks are carrying a moderately high stress (that is, greater than about 40,000 psi). These test results are typical of the many types of dynamic tests that can be carried out.

Typical case histories showing how Stresscoat has helped in redesign are given in figs 1 to 8 inclusive.

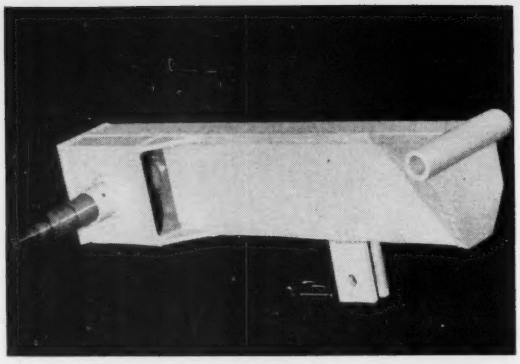


2. Rocker arm after undergoing static load stress test. Location and direction of the highest stresses are shown.

continued ▶

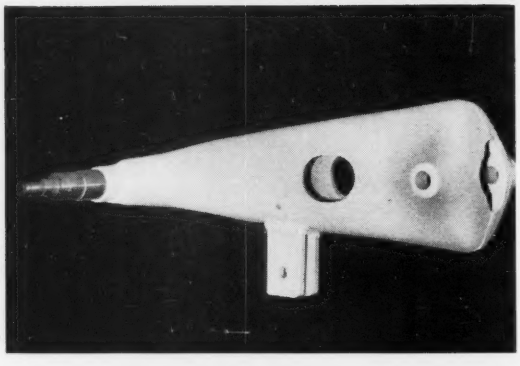
Case 1

Wheel arm support for giant mower. Fig 1 shows the original wheel arm support (a weldment). Two of these welded supports were required for each mower. One was used for the right-hand wheel, the other for the left. Since there was no interchangeability, two separate arm supports had to be stocked as replacement parts. The strength, appearance and cost left much room for improvement.



1

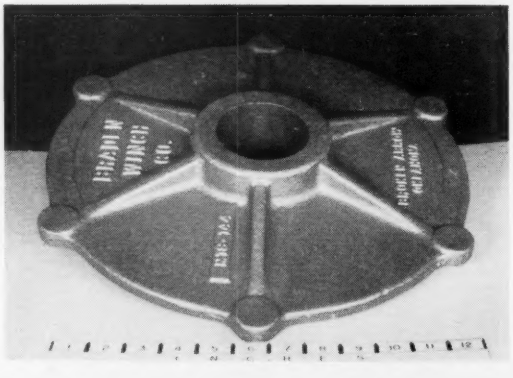
Using Stresscoat, Texas Foundries developed the cast-steel arm support of Fig 2 for use either on the left or right-hand wheel. Proper stress distribution increased the strength and improved the over-all appearance. Most important, the cost was reduced by one third.



2

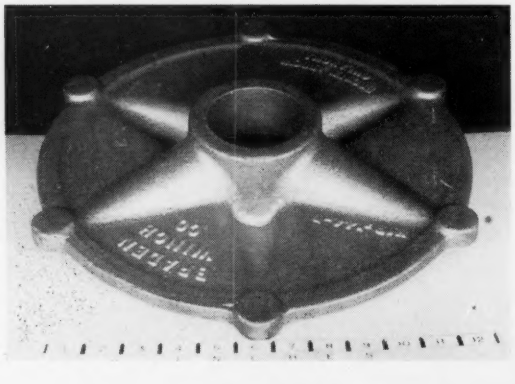
Case 2

Winch gear box cover plate. Original design of cover plate (Fig 3) developed cracks due to uneven cooling. They occurred most frequently in the cross rib sections, because of high stress concentration.



3

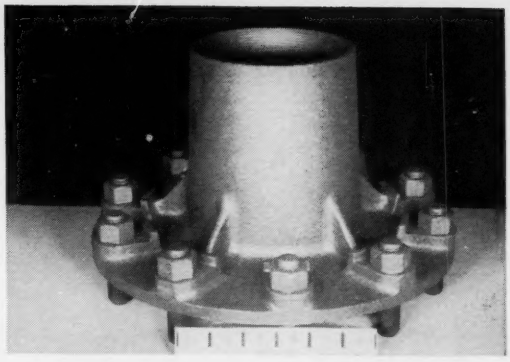
Enabled redesign (Fig 4) distributed the stresses in the cross ribs over a wider area, reduced the weight 28% and lowered the cost of production 25%. Because of the smooth-flowing lines of the cross rib sections, uneven cooling (and the resulting cracks) were practically eliminated.



4

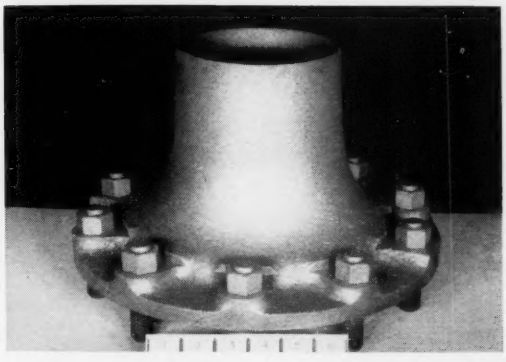
Case 3

Truck wheel hub casting. Fig 5 shows the original design of the hub casting. It was failing under actual service loads due to conditions similar to those in Fig 3.



5

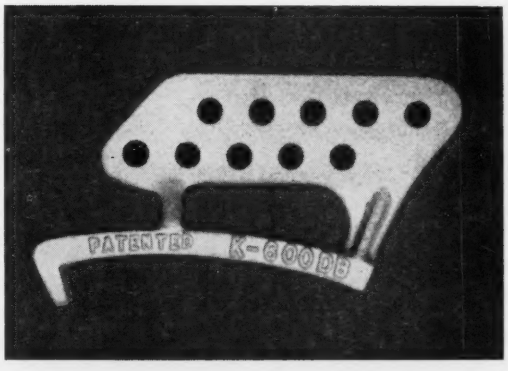
The new design of the hub (Fig 6) eliminated all sharp radii. A more even stress distribution was proved by Stresscoat. The new design is four times as strong, for the same weight and cost.



6

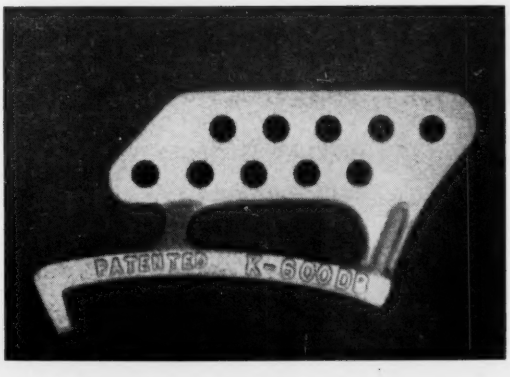
Case 4

Plow sweep bracket. Fig 7 shows both the old and the new design of bracket. A farm implement manufacturer was using a plow sweep bracket [Fig 7 (A)] made of malleable iron. Failures occurred when loads were increased beyond the limits of the original design. Texas Foundries' engineers were called in to redesign the casting.



7.

A slight modification in the original design produced a casting 57% stronger [Fig 7 (B)]. Smooth-flowing lines provide uniform stress distribution throughout the part.



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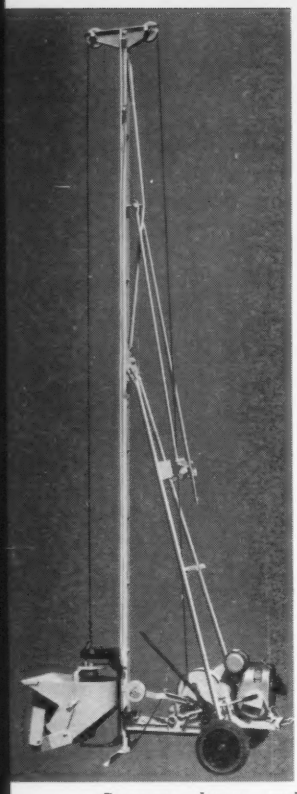
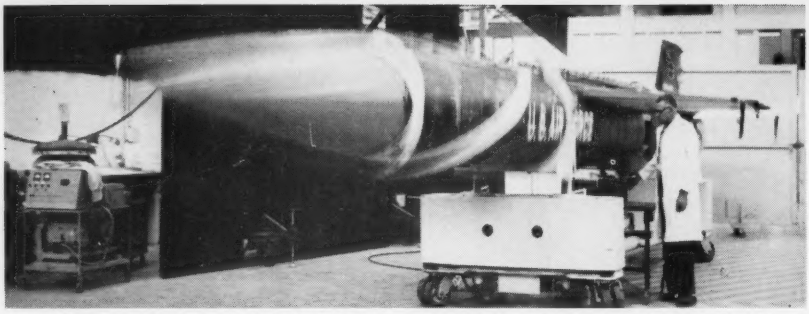
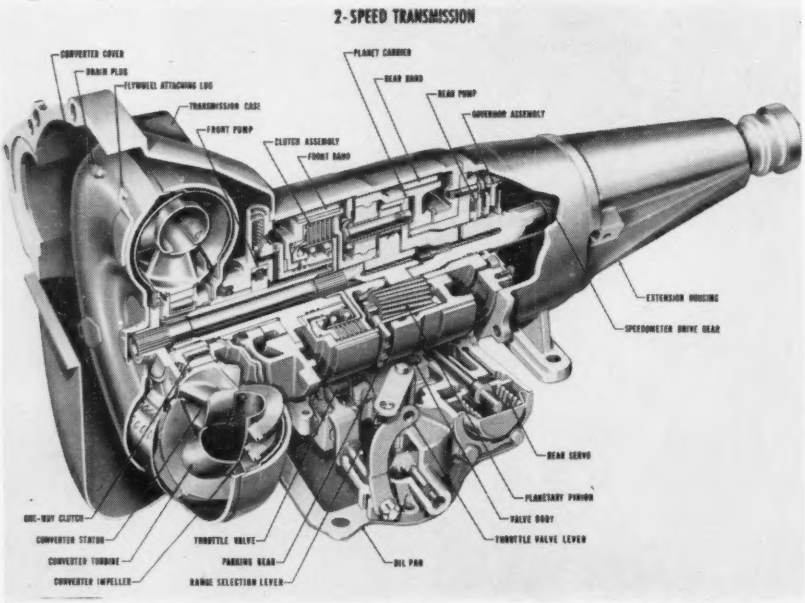


Concrete beam and column pourer swivels at 8 to 19 feet. (200)

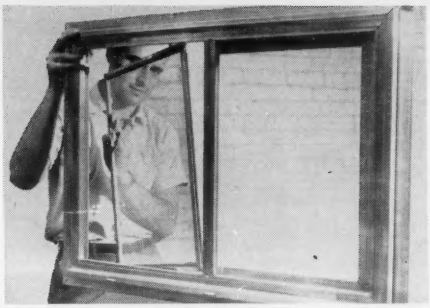


The IM-99 missile is tested by the Bomarc Bronco, a new device developed by Boeing. It bumps, bucks, sways and rolls the missile through a 2½ minute simulated flight to check the automatic pilot for roll, pitch and yaw control. (201)

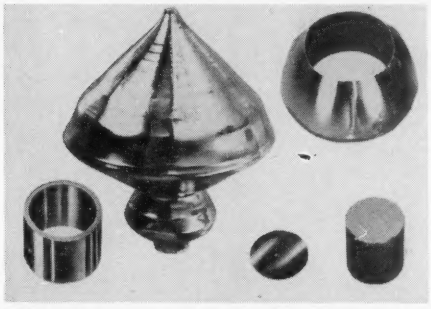
This unusual fuel train consists of 10 huge rubber tire bags towed by a FWD Teracruzer of the type used by the Air Force in the Matador guided missile program. It can transport 5,000 gallons of fluid over rugged terrain, sand, mud, ice and snow. (202)



The new, two-speed Fordomatic transmission has 27% fewer parts than the Fordomatic of 1958. Elimination of 105 parts and use of aluminum for such items as the transmission case and bell housing have reduced transmission weight by 50 lb. or 22.8% (203)

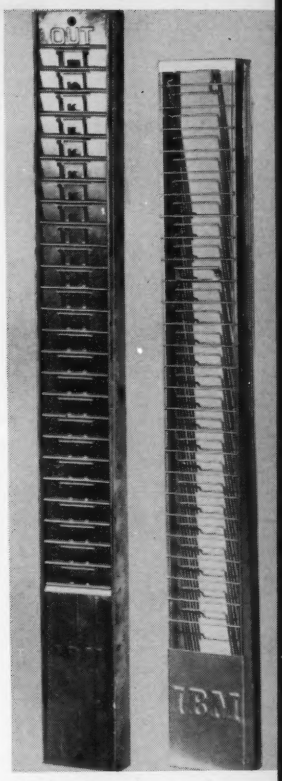


A screen and sash movable from the inside makes this Textron aluminum window easy to clean. It is weather sealed from frost. (205)



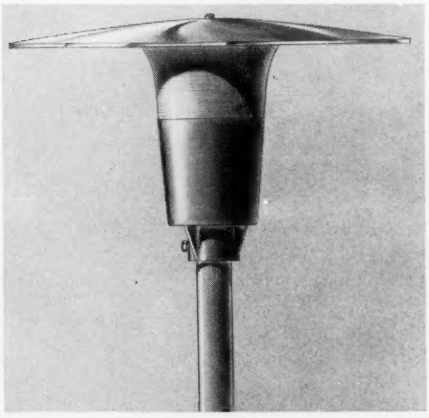
Silicon ingots up to 6 inches diameter are grown in a new-type furnace and polished for use as prisms, tubes and lenses. (206)

Bell's push-button, no dial phone has transister circuits. (207)

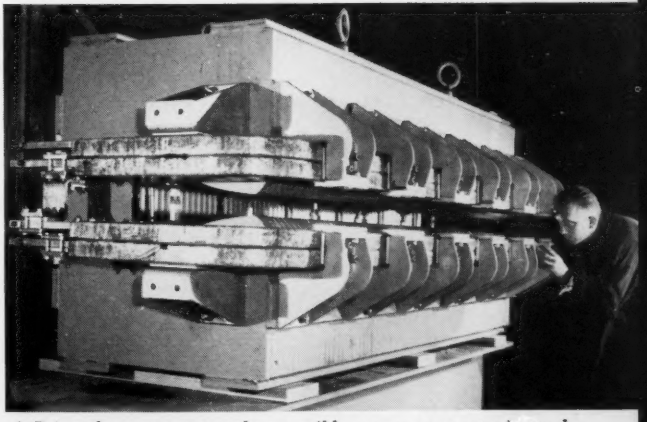


Steel wire time-card rack (right) reduces sheet steel costs. (208)

Design news in pictures



The trapeze look? By this latest luminaire we suspect that head gear for lamp posts must keep up with the fashions, too. (209)



A 7-foot long magnet makes possible a new concept of smashing the atom. Made of unusually uniform electrical grade steel, it holds atoms on course to hit and break other atoms. (210)

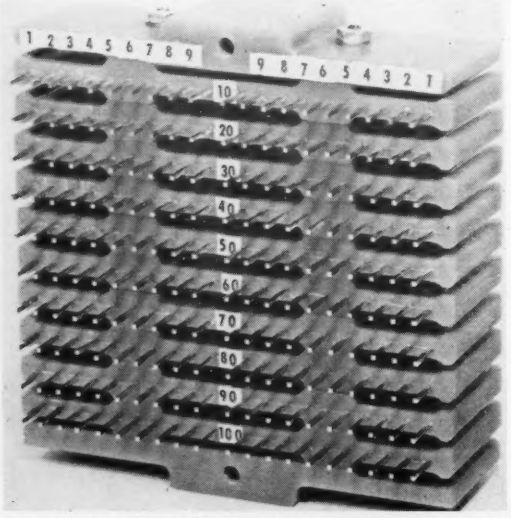
1. Wire connections on the new epoxy terminal blocks are made with a standard wire-trap terminating tool.

Electrical field favors use of epoxy resins

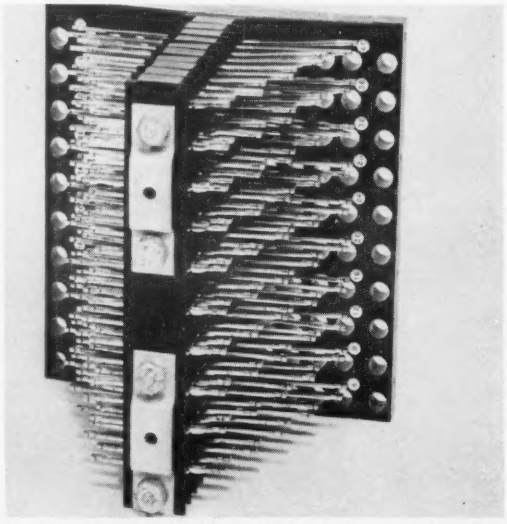
The decision to use epoxy resins results in better electrical equipment

The manufacture of electrical equipment is one field in which epoxy resins are replacing other materials. At Western Union, the decision to use epoxy in the production of a multiple-terminal block resulted in electrically and mechanically superior equipment, and provided important savings in installation and maintenance.

Engineers have been working on the design of a new terminal block for several years, because of the disadvantages of the blocks currently in use. Basically, the new design consists of a gang of individual terminal blocks or units, each containing 10 U-shaped conductors or lugs (fig 4). The units are subsequently assembled to



2. The new block has one face, numbered rows for easy location. Wire terminations slip into the grooves.



3. The old phenolic block has two faces, needs soldering of terminations. This takes four times longer.

take care of multiple circuits. For instance, a 100-wire block is composed of 10 such individual units for terminating 100 conductors, a 200-wire block is made up of 20 such individual units for terminating 200 conductors, and so on.

The resulting assembly is far more versatile than its predecessor and can be installed complete with all wires terminated in about a quarter the time. All wire terminators are on one single and easily accessible face. This means that, in critical locations, the block can be installed before connections are made and that connections can be changed readily, at any time, with the block in place. Costly individual wire soldering is eliminated, since connections are made with a wire-wrap terminating tool (fig 1). Numbers identifying each horizontal and vertical row of terminations facilitate installation, alteration and maintenance.

Original planning called for the casting of these terminal blocks with a filled polyester resin formulation. Conventional molding techniques were put on one side in favor of casting, to avoid any danger of distorting the inserts, possibly thereby shorting adjacent segments.

Even though it was recognized from the start that epoxy resin provides superior electrical properties, polyester was specified because of its marked price advantage. The first stage, therefore, saw the formulator (Smooth-On Manufacturing Co. preparing various mixtures based on polyester resins from several manufacturers, filled with different inorganic materials in varying percentages, both with and without milled glass fibres for reinforcement.

Test panels gave good results from an electrical standpoint. Without exception, however, they were too brittle, and exhibited more shrinkage than was desirable. It was apparent that, if sufficient glass fibres were used to obtain the desired toughness, the relatively high viscosity of the formulation would make encapsulation on a production basis difficult. Attempts to plasticize the formulations resulted in inferior electrical properties and lower strength. Loss of flexibility on aging was also apparent.

At this point the formulator reconsidered the possible use of epoxy resin. Because of its relatively low shrinkage as compared to polyester, it was felt that an unfilled system might prove adequate. To obtain toughness and to minimize shrinkage, a polyamide type of curing agent was selected. Tests of this combination proved it to be tougher and stronger than any of the polyester formulations. Shrinkage of the epoxy during cure (only a few tenths of a percent) was much lower than even the filled polyesters, thus eliminating any tendency for the connectors to "toe in" during cure. And where polyester continues to shrink after hardening, the epoxy resin remains dimensionally stable.

During production a number of problems were encountered, the chief one being the longer curing cycle of casting as compared with pressure molding. A large number of cavities were required to compensate. This was solved by designing the dies to provide molded phenolic cavities By this means, any number of cavities are made available to suit production needs and to provide replacement cavities at frequent intervals, in order to maintain optimum quality castings. The native adhesion of epoxy resin created a problem which was solved only after careful screening of a number of mold release agents. At length, everything fell into place, and the first production order delivered to Western Union.

Service tests now substantiate the laboratory tests indicating that the use of epoxy should result in these advantages:

(1) Marked improvement in dimensional stability.

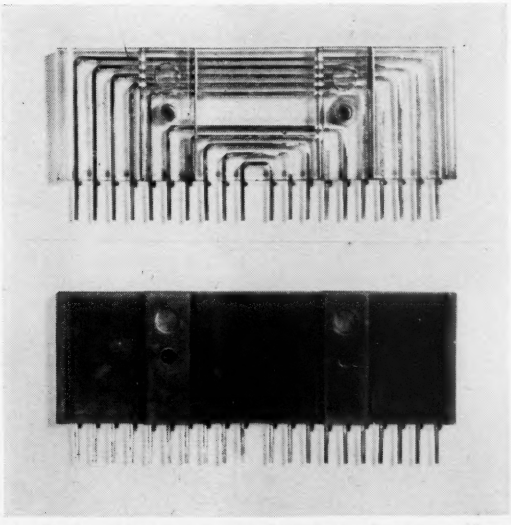
(2) Lower moisture absorption, resulting in higher surface resistivity under conditions of high humidity and elevated temperature.

(3) Permanent toughness, superior flexibility and excellent strength.

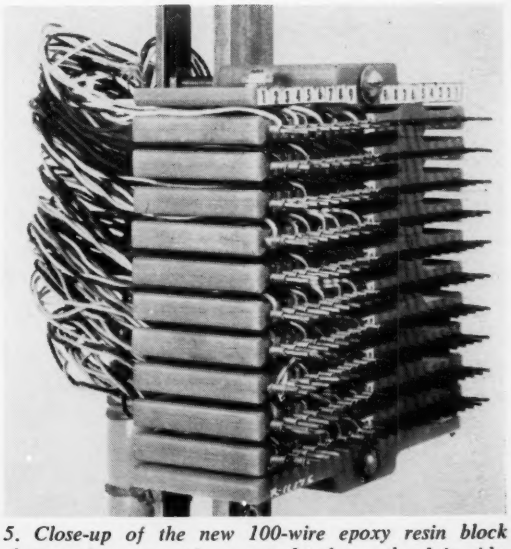
(4) Less weight.

(5) Important installation and maintenance economics.

Because the field tests show the new unit to be better (electrically and mechanically) than the phenolic blocks, it is expected that the new block will ultimately replace the old throughout the system (figs 2 and 3). ★



4. Each unit has ten U-shaped conductors. Above shows lug elements. Below is the normal opaque unit.



5. Close-up of the new 100-wire epoxy resin block shows wire connections completed on the left side.

Ideas round-up

Strut tester: loading members are in tension

Slender struts are usually tested with pin joints at both ends, because this is the theoretical condition most readily achieved (or closely approximated) in practice. In conventional testing machines, this results in a compression column with two pin joints. The instability of this column makes the accurate alignment of the loading members important, and reliable testing thus becomes difficult.

A machine proposed by H. Fessler of Nottingham Unversity (in the Journal of the Royal Aeronautical Society, July 1958) overcomes these difficulties, because the loading members are in tension. Fig 1 shows the simple arrangement of four equal pin-jointed links AB, BC, CD and DA. The strut to be tested is represented by AC, which is, of course, compressed when a tensile load P is applied at B and D. Each tension link consists of two equal bars placed symmetrically relative to the vertical plane containing the forces P and the axis of the strut; this reduces the stresses in the hinge pins. The weights W_1 and W_2 are connected to BC and AB respectively and adjusted to balance the weight of the links, so that the frame without the test strut is in neutral equilibrium. This facilitates loading and avoids allowing for the weight of the apparatus when the force P is applied as a dead weight. Alternatively, the machine can be loaded in a tensile testing machine.

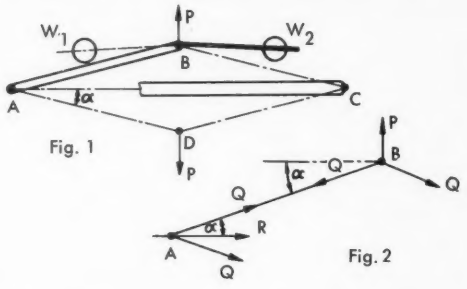


Fig. 1

Fig. 2

If the load in each link is Q and the load applied to the strut is R it can be shown (Fig 2), by analysing joints A and B, that:

$$R = P \cot a \text{ and } Q = \tfrac{1}{2} P \operatorname{cosec} a$$

This assumes frictionless pin joints. A method of analysis when the pins are not frictionless is given in the original reference. (211)

Servo valve: this Methuselah has a million cycle life

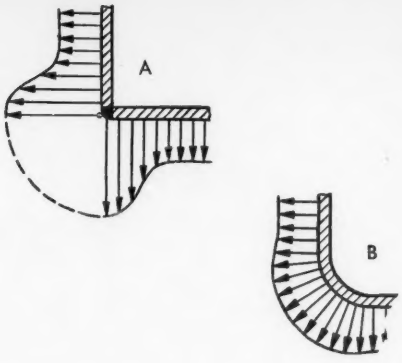
A compact, light 3-way servo valve, which uses concentric spools yielding a 2-stage closed servo-loop with unity positional gain, has been developed by Consolidated Controls Corp., a subsidiary of Consolidated Diesel Electric Corporation.

The unit (its designation is 141SV66) has successfully completed qualification tests demonstrating a cycle life of more than a million at operating temperatures ranging from minus 65 to plus 450 F. The test unit is being used currently as a component of the control system regulating a turbo-jet engine exhaust nozzle.

The input "breakout friction" of the unit is less than 10 gm regardless of second stage load. The valve flow rate is linear up to 15 gpm at .030 stroke for 1,000 psi drop. Leakage at neutral is less than 12 cu-in. per min.

The ½ in. tube size hardened male fittings contain integral filter screens. Fabricated from stainless steel, the entire valve weighs only 16 oz. (212)

Round corners: they are stronger and stand up better



The ordinates in (A) represent the approximate character of the maximum stresses in the region of a **square** corner in a vessel under pressure. Note the considerable increase in stress at the corner. This is due to high stress concentration in the sharp angle and to discontinuity stresses originating from the rapid change of direction of the surface.

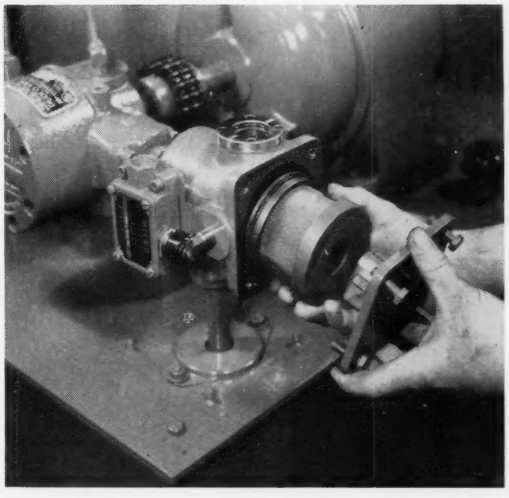
At (B), the ordinates represent the approximate character of the maximum stresses in the region of a **round** corner of a vessel under pressure. Stress concentration is reduced and discontinuity stresses are smaller. Hence there is little increase in stress at the corner. Equipment stands up better.

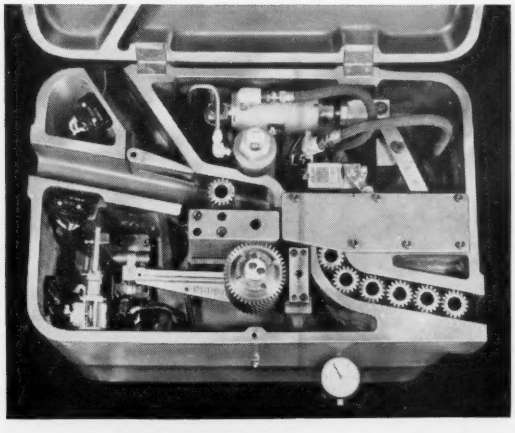
(Information taken from a guide to alloy sheet and light plate fabrication, by S. Blickman, Inc.) (213)

Tell-tale filter: a warning when it needs cleaning

The Tell-Tale filter (Stratoflex of Canada, Inc.) performs the primary function of filtering (it stops the dirt) as well as any other good filter. It differs from the others, however, in its ability to help the user keep the filter clean for it tells the operator when it requires cleaning, and tells him long before bypassing begins. In fact, it indicates how long it may be before bypassing will begin. Only if its warning is ignored does it eventually begin to bypass fluid to protect the pump. It can be arranged automatically to stop power to the pump so that the warning cannot be ignored. By thus removing the responsibility for keeping a check on filter conditions, the Tell-Tale sets new standards in efficient, low-cost filter maintenance.

In addition to the existing suction and return line units, a new range of full flow hydraulic filter units for pressure line service at 3,000 psi has also been introduced. They are the first commercially available filters to be sub-plate mounted. Control panel mounting places them where the cleaning indicator can be seen. They are available in 10, 20, 30 and 60 capacities with filter cartridges of 238, 149, 74, 40, 30 and 20 micron openings. (214)





Gear monitoring unit: it searches out eccentric parts

An automatic gear monitoring unit that inspects spur or helical gears for concentricity has been developed by **Michigan Tool Co.**

Parts within predetermined tolerances pass on to the next operation; eccentric parts are shunted from the system. Total time for the full checking cycle is 6 sec. and accuracy adjustment is infinitely sensitive to errors.

The new unit (shown in our photograph with the aluminum front cover lowered) uses meshing action in two directions of rotation against a master gear to check concentricity. (215)

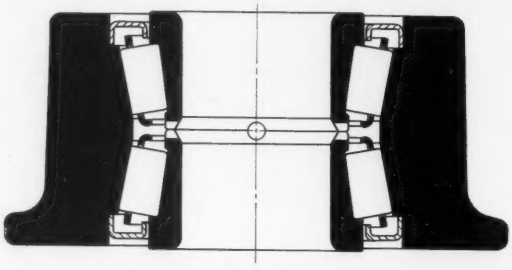
Roller bearings: pallet conveyors find them useful

A roller bearing application has been developed by The Timken Roller Bearing Company for pallet conveyors. The successful operating experience with hundreds of these bearings indicates a growing market for this type of application.

The pallet wheel conveyor bearing is a double row, pre-adjusted, tapered roller bearing in which the flanged wheel profile is integral with the outer race. Stamped closures are supplied with the bearing. Lubrication slots are provided at the centre of the bearing to allow grease to be introduced through the stationary shaft.

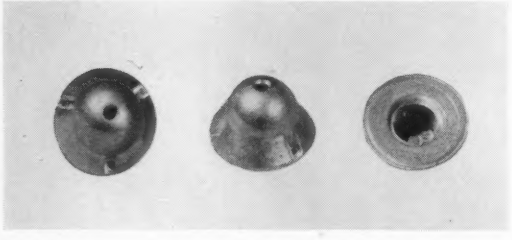
An alternate pallet conveyor bearing design, using a straight or cylindrical outside diameter instead of the flanged wheel profile, has also proved to be highly successful.

These case-carburized bearings have the advantage of a hard wear-resistant surface, with a tough core to resist the heavy shock and impact loads that characterize bearing service on pallet conveyors. Ample radial and thrust capacity is another feature. (216)



Cap nuts: petty thieves have been outwitted

Low cost, tamper-proof cap nuts, recently developed by Gries Reproducer Corporation, provide an effective solution to the problem of pilfering of wheels from shopping carts, garden carts and the like. In response to customer complaints that conventional cap nuts were being removed from cart axles, and the wheels stolen, several manufacturers expressed the desire for a simple, low cost fastener that would resist removal with ordinary tools. Gries has provided the answer with an attractive, one-piece die-cast zinc alloy nut, that can be removed from the axle only with a special wrench.



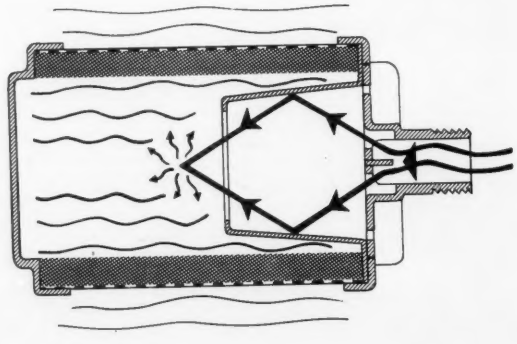
The base of the cap nut is designed with a wide washer-type configuration having three notched recesses to accommodate the special wrench. The wide washer base eliminates the need for a separate washer, thus reducing inventory as well as the number of assembly operations required. The sides of the nut are sharply tapered from base to top, to prevent pliers from securing a sufficiently strong grip to loosen the nut. To provide lubrication for the axle after assembly, a tiny hole has been designed in the hub of the cap nut. (217)

Noise silencer: this new muffler silences escaping air

The 1959 model Atomuffler (pneumatic muffler) features an improved, internal resonator that is more efficient in silencing the irritating noise resulting from air-operation. This new, M-Series muffler is made by Allied Witan Company.

As speeding air leaves the air-operated machine's exhaust port, an internal deflector in the device breaks up the air jet. The resulting, scattered waves are parabolically reflected into many opposing, high-velocity forces. Collision of these forces cancels the rushing air before it can become an ear-splitting noise. A radial disseminator then permits the lowered-velocity, exhaust air to drift quietly into the atmosphere.

This cancelation principle enables the small, compact Atomuffler to diffuse escaping air at a ratio of 60 to 1. The device is claimed to be the only pneumatic muffler designed to attain such a high radiation ratio, and still accommodate the full air flow, regardless of the size of the exhaust cylinder. The only measurement a buyer need specify, therefore, in ordering one, is the nominal diameter of the exhaust pipe opening. (218)



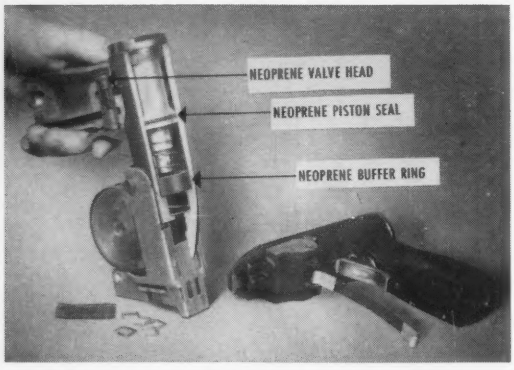
Continued on page 70

Briefs

We note with interest . . .

. . . that Canadian manufacturers may obtain models of their products from a Toronto design house, so that they can test and display new products in any material before going into production . . . some worth-while conventions coming up are: PEI's 20th Annual Shop Practice Forum at the University of Illinois, Urbana, November 5, 6, 7, 1958, which has for its theme "Modern Practises in Porcelain Enameling" — the Eighth National Plastics Expostion in Chicago's International Amphitheatre, November 17-21—the British Business Computer Symposium in London, England, November 28-December 4, to which H.R.H. The Duke of Edinburgh is Patron—the National Industrial Production Show of Canada, May 4-8, 1959, Toronto. (The British engineering industry has announced it will have its own section at this show) —an international convention on transistors and associated semiconductor devices in London, May 25-29, 1959 . . . the British Comet Four lands on a 2,000-yard runway compared with the 3,000-yard runway needed by the big American jet liners, a disadvantage to the American liners since there are only three such runways in Britain and even fewer in most European countries . . . volume I of the proposed three-volume "Handbook of Automation, Computation and Control," a four-year project of an American firm, has just been published . . . moving sidewalks and small cars on moving belts are being used to convey passengers in some American airports, terminals and transit systems; one of these car conveyors we saw used at the 1958 CNE . . . the international flavor of last month's annual convention of the American Society of Civil Engineers when it held joint sessions with the International Bridge and Structural Engineers . . . new nonelectrical exit and emergency markers which are claimed to provide uninterrupted light for 25 years through the use of a glass tube coated with special phosphor and filled with tritium gas . . . a 5,000-lb vibrator, reputedly the largest system of its kind in Canada, has been added to the environmental laboratory at Canadian Westinghouse . . . two-way radio owners needing greater communication range can upgrade their systems at half the cost, it is reported, through an add-on 250/330-watt economy power package . . . a new sensitized paper appears to have increased the output from diazo machines with no sacrifice of print density . . . the introduction from Switzerland of an economical method of producing seamless aluminum cans and containers . . . a contract has been awarded to a Canadian company for a system range data processing system to be used in forthcoming trials of the Sparrow II air-to-air missile and the CF-105 Arrow . . . during this fall and winter a traveling show will visit nine American cities and one Canadian exhibiting high-speed document reproduction through xerography and unitized microfilm . . . we can back up our pleasure in coffee drinking by quoting scientific proof from a new booklet entitled, "The Coffee-break—Why It Helps Efficiency, Morale, Safety" . . . McMaster University, Hamilton, Ont., offers three extension courses in metallurgy, each course consisting of 26 evening lectures, with a certificate in the metallurgy of iron and steel awarded . . . a new long-wearing nonslip floor covering which claims to be particularly useful where traction is desired has been announced by a Canadian firm . . . modern lens designers are able to predict the exact performance of a lens before making a sample through the use of a new mathematical model of an optical system . . . workers in insufficiently insulated working areas can now keep warm by radiant heating panels which are suspended from above . . . the fight against stream pollution has led to a new waste treatment involving a corrugated plastic packing material which provides greater areas for the oxidation by microorganisms of the wastes . . . an icebreaker may now know what it is heading into up to a radius of 35 miles through the medium of airborne television . . . a Stratford, Ont., man was awarded the largest single cash prize ever granted under the Federal Government's suggestion award plan for his design of a safer, more practical and more economical method of calibrating radiation detection equipment . . . designs are being considered by BOAC and other world airlines for Bristols' proposed 2,000 mph, ramjet engine airliner to carry 150 passengers nonstop London to New York — calculated time table is London 12 noon, Montreal 2.10 p.m., Hawaii 7.20 p.m., Adelaide 12.40 a.m. . . . the introduction of a homogeneous acid milling dyestuff which is said to give attractive bright bluish reds under economical conditions . . . street lights and industrial lights using mercury lamps can gain 28% more light over the life span of the present mercury lamps, it is claimed, by using a new 400-watt lamp recently manufactured . . . America's aircraft industry apparently has made recent important advances in the campaign to quiet the roar of jet engine exhausts and the whine of jet compressors by a new type inlet noise suppressor . . . recent research in metal sputtering indicates that this relatively old-fashioned technique can produce precision printed circuits for modern communication equipment . . . several new names of businesses on the Canadian scene, some of which are: Tatnall Measuring & Nuclear Systems, Ltd. (formerly called Non-destructive Testing Corp. Canada Ltd.) — Brook Electric Motors of Canada Ltd. (formerly on an agency basis with the British firm)—Hunting Airborne Geophysics Ltd. (formerly Aeromagnetic Surveys Ltd.) . . . a small industrial locomotive powered by batteries has been manufactured for use inside the Rock of Gibraltar. It will have a run of about ¾ miles, and will be fumeless and noiseless, a must because of its confined space . . . within a year, apparently, it will be common to see battery-powered portable TV sets which will work outdoors or anywhere within range of a station, made possible because of a light, highly efficient battery with plates of nickel-vanadium, formed from metal powders by a new process . . . a new American standard for diamond dressing tools has been developed by the American Society of Tool Engineers . . . also, this same society has completed the second phase of its study into the use of boride composites for metal-cutting tools, available to anyone in a 61-page report . . . a Toronto tool company makes a new electric saw with a blade that does not rotate but oscillates at high speed . . . a new manual is available to the public on carbon and graphite properties, giving detailed application and performance data and even showing how carbon and graphite are made . . . mild steel and other low-cost metals are now being given resistances usually found only in stainless steels and other high alloy metals, an American company claims, through a new process which provides sheet metal parts with a furnace-bonded protective coating . . . the unusual offer by the manufacturer of a new welded joint to test it under any extreme condition. The joint is sent to the user inside a test tube under highly stressed conditions, said to be more severe than any encountered in service . . . changes in the specifications for mild steel electrodes have been announced by the American Welding Society . . . a link in U. S. continental defense operations has been provided by Canadian Westinghouse by the development of its superhigh frequency "scatter" communications system that sends signals far beyond the earth's horizon.

Stapler: it has a pistol grip and shoots 5,000 times



An industrial stapler manufacturer has developed a pistol grip tacker capable of 5,000 shots without reloading. The device is air operated and weighs less than 2 lb. An expendable plastic magazine contains the precut staple-forming wires in a continuous roll. The magazine is prefilled with the flexible ammunition belt. It can be snapped on the gun in a few seconds to replace an exhausted magazine.

Staples are formed just prior to ejection from the muzzle. The mechanism involves two concentric pistons, one to form the staple, and one to drive it. Neoprene seals on each piston eliminate the need for an airtight lap finish on the reciprocating metal parts. Neoprene buffer rings at the drive end of the cylinders also cushion each piston stroke, to cut down excessive wear and noise. In both these applications, oil resistance is required. The piston seals must also withstand abrasion, and the buffer rings, repeated impacts.

Actuation of the pneumatic tacker is controlled by an air valve in the handle. The manufacturer specified neoprene for the valve head. This was as a direct result of his experimentation with other rubbers for the seals and buffer rings. Eventually they swelled, cracked, hardened and shattered.

(From a Du Pont Elastomers notebook.) (219)

Vulcanized fibre: is used in making model trains

The versatility of vulcanized fibre (sometimes overlooked in the excitement over new materials) has solved an armature insulation problem for The Lionel Corp., manufacturers of model trains.

The bend-resistance of one type of vulcanized fibre was put to good use in the design of armatures for small motors, whilst the bend-acceptance of another grade proved a boon in the design of armatures for larger model train motors.

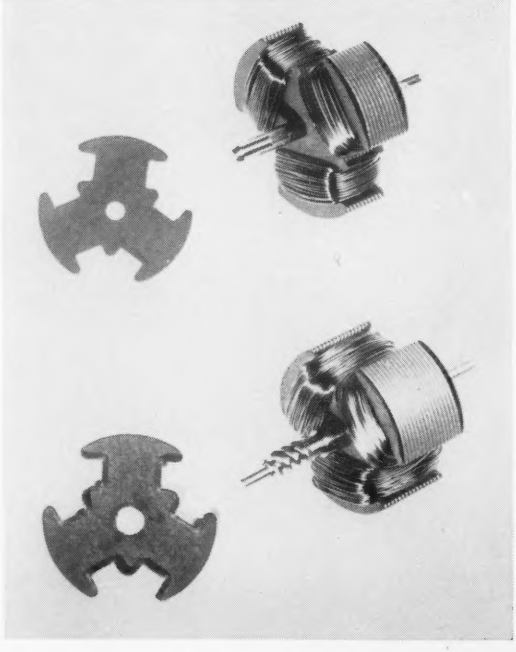
In both cases, the vulcanized fibre is fabricated into "fibre heads," which are used to separate the armature windings from the laminated body (or stack) and thus prevent the metal stack from rubbing off the insulating varnish on the wire. By separating the windings from the stack, the fibre heads also help to insulate the windings.

The stack for the smaller armature is 5/16 in. thick and it is wound with six layers of copper wire. For the larger armature, the stack is ½ in. thick, is wound with 10 layers of heavier wire.

In both armatures the fibre head is the same shape as the stack. In the small armature it is slightly larger, so that its edges overhang in the areas where the armature is wound. This overhang keeps the wire from touching the steel stack. In the small armature the fibre must be tough and dense so that it will not bend down or be dented by the wire as it is being wound.

On the larger armature this design did not prove as practical, because the heavier wire and greater number of wire layers cauld cause the wire to cut into the protruding edges of the fibre. A new design was required.

The problem was persented to Taylor Fibre Co. Its engineers and production men found the answer by (1) recommending their fish paper grade of vulcanized fibre; (2) developing a special fibre conditioning process to increase its formability and (3) enlisting the help of top tool designers to devise suitable dies for the operation. (220)



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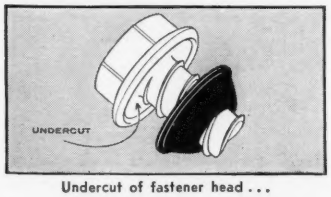
News about NEOPRENE

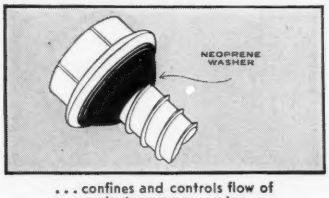
NEOPRENE washers are integral part of leakproof, cushioned fastener

A combination of an undercut head design and a conically shaped neoprene washer gives special advantages to these fasteners.



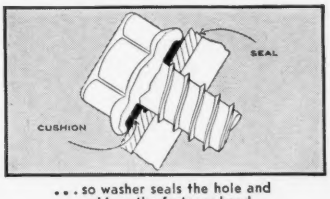
Undercut of fastener head . . .

The washer cushions the head and prevents metal-to-metal contact. Finishes are protected; transmission of vibration noise and squeaks is reduced.



. . . confines and controls flow of conical neoprene washer

As the fastener is secured, the undercut head confines and controls the spread of the resilient neoprene washer, which, in turn, flows into the top threads and seals the fastener hole.



. . . so washer seals the hole and cushions the fastener head.

It's another example of good design made possible with a part made of neoprene—the Du Pont synthetic rubber that is used throughout the automotive industry for resistance to oil, ozone and weather. Just clip the coupon for more information.

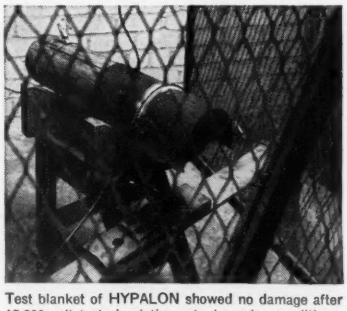
Lineman's blankets of HYPALON* take 15,000-volt shock for 147 test hours without damage

HYPALON retained full insulating value in test that burned through ordinary rubber in 12 minutes

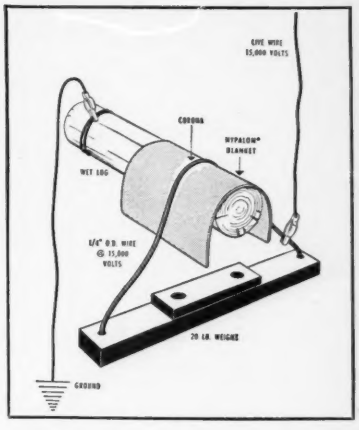
Telephone poles often carry power lines in addition to telephone wires. When a pole needs replacement, telephone linemen usually do the job if power line voltage doesn't exceed 15,000 volts. In jockeying a new pole into position it may brush against the power wires. If the pole is wet it is conductive enough to be dangerous. Wet or not, linemen protect themselves against possible electrocution by wrapping the top of the pole with insulating rubber blankets.

Natural rubber blankets have high insulating value, but are vulnerable to corona cutting and deterioration from sunlight and weather. At the first sign of a cut or burn they must be discarded.

The extraordinary resistance of HYPALON synthetic rubber to ozone, sunlight and other oxidizing agents suggested its use for linemen's blankets to engineers at Bell Telephone Laboratories in Murray Hill, N. J.



Test blanket of HYPALON showed no damage after 15,000-volt test simulating actual service conditions. Test was discontinued after 147 hours.



Bell engineers devised a test closely simulating actual service conditions (see sketch). They soaked a pole stub in water, grounded it, draped a blanket over it, pressed a ¼-in. copper conductor against the blanket and applied 15,000 volts. Resultant arcing produced constant corona and evolved strong ozone. Ordinary rubber blankets failed quickly . . . some in 12 minutes. But a blanket of 100% HYPALON withstood 147 test hours with no corona cuts, ozone cracks or burn-throughs. Longer testing was considered unnecessary.

Performance like this makes HYPALON an excellent choice for parts or products subject to ozone, corona or strong oxidizing conditions. Mail the coupon for details on how this Du Pont synthetic rubber can help you in designing new products and improving old ones.

***HYPALON** *is a registered trademark of E. I. du Pont de Nemours & Co. (Inc.)*

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☐ Add my name to the free mailing list of the *Elastomers Notebook* (contains articles based on uses of Du Pont elastomers in industry).

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Energy cartridges: they hold spring washers together

Patented Flexi-Pak energy cartridges, in which pre-assembled stacks of belleville spring washers are held together by a flexible elastic covering, are now available from Associated Spring Corporation. This new form of cartridge is designed for applications where pins or rivets cannot be used to hold the washers together, because the washer walls are too narrow, or where retaining rings or cores cannot be used, because there is insufficient vertical or radial clearance.

Two types of covering are being offered: a molded covering, which is cured around the washers while they are under a slight load, and a dipped or sprayed coating, which is applied to the stacks while they are held firmly together but relaxed.

The molded covering (usually made of rubber, neoprene or vinyl flexible material) is sufficiently rigid that it cannot be forced between the washers and will not bulge outward in service. "Lips" hold the washers securely, yet permit them to be snapped out of the covering easily, if replacement is necessary. The dipped coating is applied in latex form. Both types of covering serve to reduce the total weight of the assembly, reduce friction and contribute to noise-reduction.

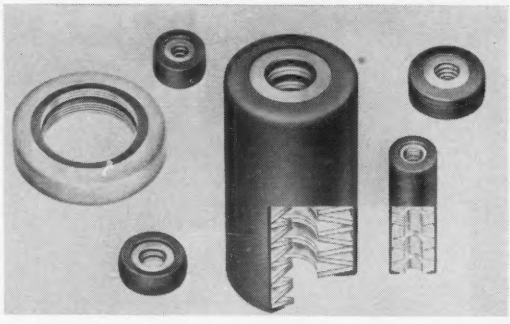
Energy cartridges provide compact spring components capable of exerting or absorbing high loads within a limited space, that is, with small deflection. A few of the many possible uses for these units are:

as a shock-absorber, in spring mountings for punches and dies in heavy-duty industrial presses, in vibration-isolation mounts for such products as airborne electronic equipment or machinery running at high speeds.

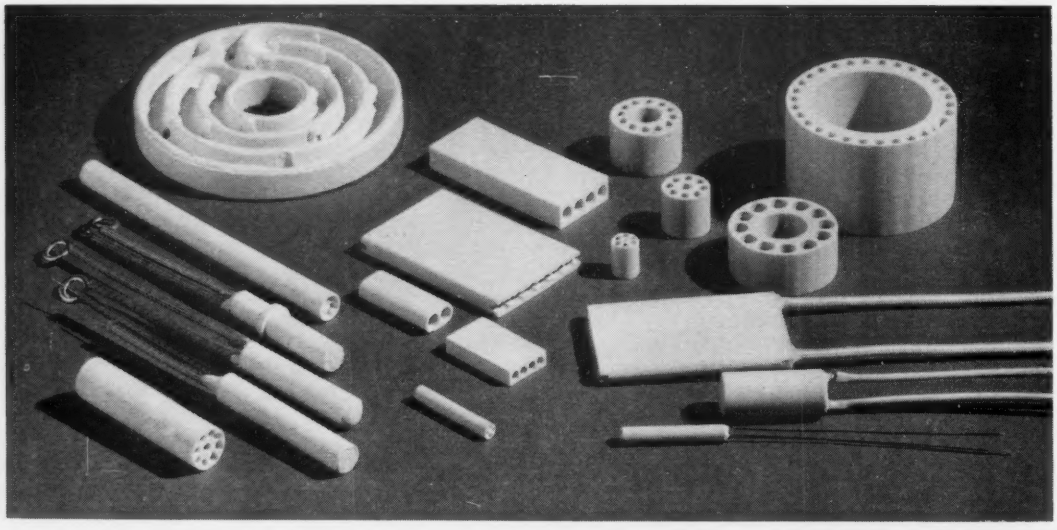
to exert a large force in a limited space, as in die springs and ejecting and stripping devices.

to exert force at a low rate, as in clutches for automotive drives, machine-tool chuck and spindle drives.

to maintain reasonably constant pressure, in spite of expansion due to temperature variations, as in face-type seals for steam pumps. (221)



Ceramic heaters: they apply spot heat to units



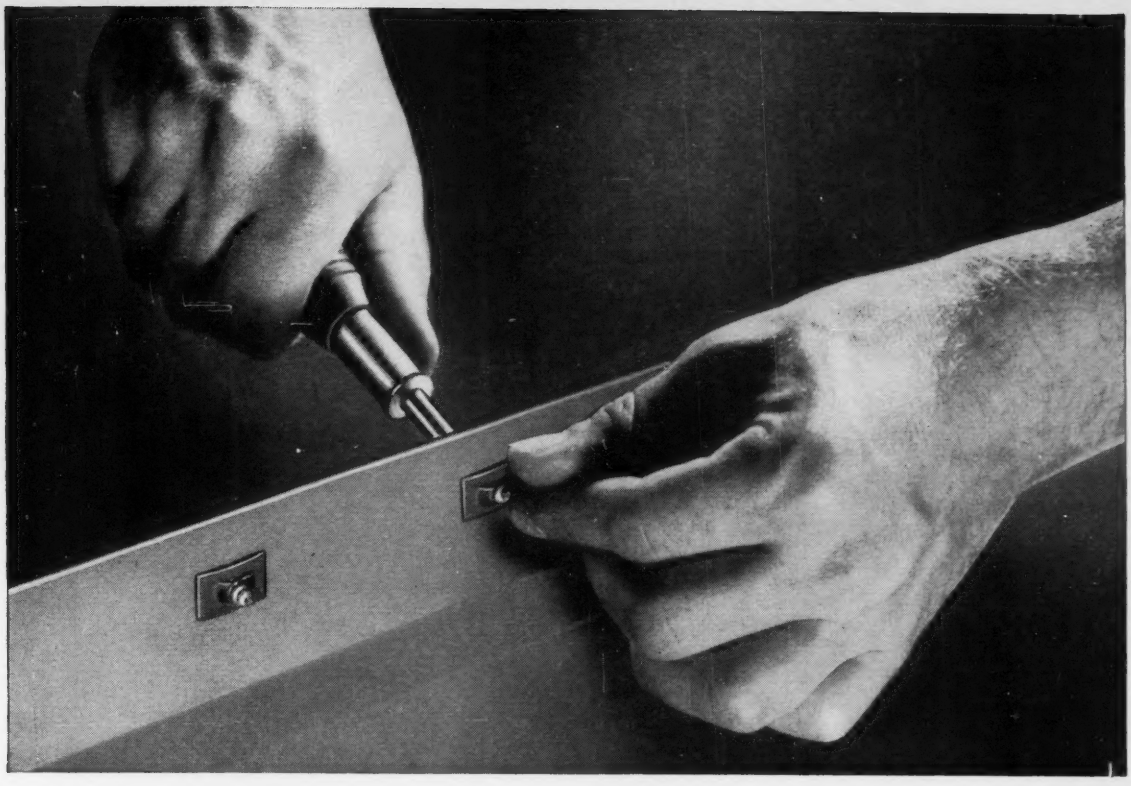
There are some spot heat applications that require a unit similar to the shape of a cartridge unit without the watt density or the ruggedness. A line of ceramic body units made by Hotwatt, Inc., were designed for this purpose. Some of the applications are:—

Appliances: automatic coffee-pot warming units.

Small tools: soldering irons, branders, wood-burning irons, sealing tools, curling irons.

Instrumentation: missiles, gyros, resolvers and phase shifters, meteorological instruments. (222)

Continued on page 78



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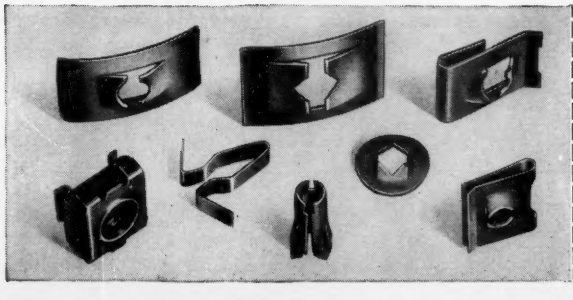

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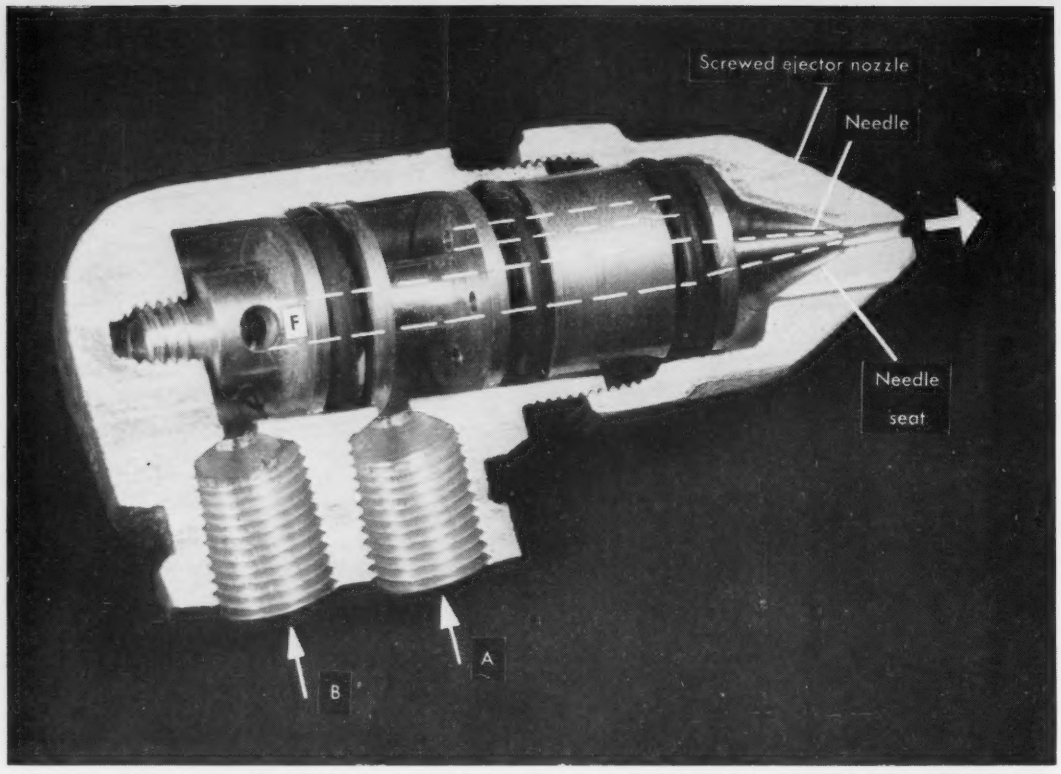


Air enters A and passes through holes to nozzle. Coola nt enters B and, via F, is vaporized through the nozzle.

Spray nozzle is a new Canadian design

This ejector nozzle adjusts both air and liquid in one simple control

A spray coolant feeder (originally designed by Obim Mfg. Co., for the machine shop) seems likely to have a host of applications in other fields.

As a coolant feeder, the Spraymaster (as it is called) works as shown above.

Air from the plant air line enters at (A) and passes through the holes leading to the nozzle which together are equal in area to (A).

The screwed ejector nozzle at the end of the head is the only control and the only moving part. As it is unscrewed (that is, to the right) it moves the needle seat away from the needle. This movement releases the air and sets up a venturi which sucks the coolant through entrance (B) and then via (F) through the centre of the needle. The coolant is vaporized in the short passage through the nozzle.

By unscrewing the nozzle further, the amount of air and the coolant is increased all the way from a fine mist to a heavy spray. Beyond a certain point, even though the amount of air increases, the venturi effect drops off, and decreases the amount of coolant. In this way, a heavy jet of air for chip blowing is available with any given quantity of coolant.

A goose-neck attachment to the nozzle assembly enables the jet to be directed on to the work at will. This, with the various clamping methods possible, means that it is easy to fit the feeder to any machine, be it drill, saw or lathe of any type.

Heat is dissipated by the combined effect of the expanding compressed air, evaporation of the coolant and the rapid movement of air. If a finger is placed over the nozzle, the air blows back right through the coolant feed, clears it, and mixes the coolant in its container.

Likely applications

As it is (or with slight modifications) the spray is expected to find uses in:—

Paint spraying. Two containers, paint and compressed air, would allow the operator complete freedom of movement.

Dust suppression, humidification or disinfection.

Rock drilling.

Test control.

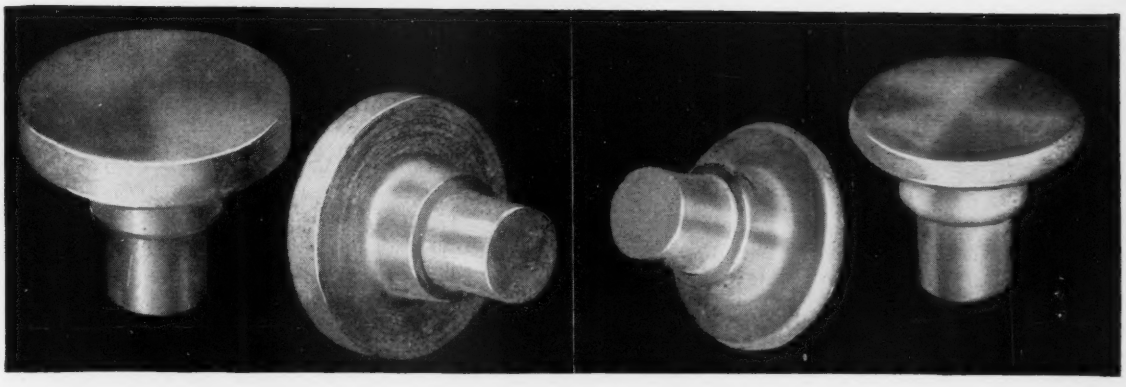
Isolation of salts (by evaporation effect).

Homogenization. ★

TO SAVE ON **FASTENERS**

Standardize your Specials

THROUGH STELCO COLD HEADING



Machined "Special" . . . slightly redesigned as a Cold Headed "Standard"

The simple Flat Head Shoulder Rivet shown on the left above (enlarged), was slightly amended as seen on the right, to permit production by cold heading instead of by machining. The elimination of scrap loss, combined with increased speed of production, brought a saving of 80% to the purchaser.

Pictured below are several other "specials" standardized by Stelco with considerable cost reduction.

57121.B

Result - 80% Savings!

Stelco's modern bolt-making facilities, plus the services of Specialty Fastener Representatives, offer you three ways to save on "special" fasteners —

FIRST — Many types of contoured parts can be produced by cold heading more economically than by machining. Not all savings are as impressive as the one illustrated above, but *cost reductions in the region of 40% are not uncommon* and are often accompanied by minor redesigning which adds to the strength of the part. Secondary operations, such as thread rolling or cutting, knurling, extruding, flattening, piercing, drilling, broaching, and bending are also provided for in Stelco's facilities.

SECOND — Stelco will carry as stock items your long-run repetitive "specials" — giving you a ready source of supply and the benefit of large-quantity prices.

THIRD — Your "special" requirement might already be in stock as a Stelco "Standard" — or possibly an existing "special" could meet your needs. In either case you would realise a saving.

Why not ask Stelco's Engineers to examine *your* "specials"? If they are adaptable to production by the cold heading process your cost reductions will be substantial. Any Stelco Sales Office is at your service.

THE STEEL COMPANY OF CANADA, LIMITED

Executive Offices: Hamilton and Montreal

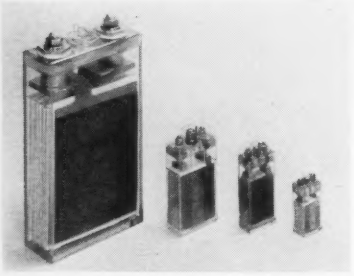
Sales Offices: Halifax, Saint John, Montreal, Ottawa, Toronto, Hamilton, London, Windsor, Winnipeg, Edmonton, Vancouver. J. C. Pratt & Co. Limited, St. John's, Newfoundland.

New products & materials

Nickel cadmium storage batteries

Unsurpassed reliability and long life under extremes of environment are features claimed for **Nicad's** improved sintered plate nickel cadmium storage batteries.

Low internal resistance (0.001 ohms for 10 amp-hr type cell) permits high discharge currents. Absence of corrosive fumes is advantageous in enclosed spaces.

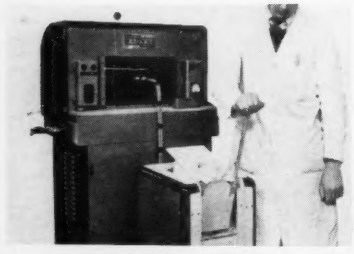


A nominal discharge of 1.2v per cell permits batteries to be made up in voltages in multiples of 1.2. Capacities range from ½ to over 150 amp-hr. Uses include portable electronic equipment, missile auxiliary power, aircraft engine starting and data processing. (224)

5-lb. laboratory furnace

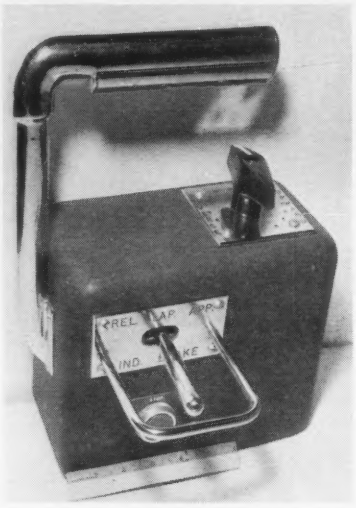
A small melting unit has been specifically designed by **Radio Heaters Ltd.** to enable metallurgical and other laboratories to melt small quantities of special alloy steels and nonferrous metals for experimental and short production purposes.

The equipment consists of two basic items — a 6-kw high-frequency induction heating generator and a melting furnace.



The melting unit has a rated capacity for 5-lb melts. The furnace itself is equipped with a vertical pouring handle and arranged for lip pouring. The furnace is normally supplied with a sillimanite crucible and will melt 5 lb of steel in 20 minutes, 5 lb of brass in 12 minutes and 2½ lb of aluminum in 12 minutes. (225)

Portable control station

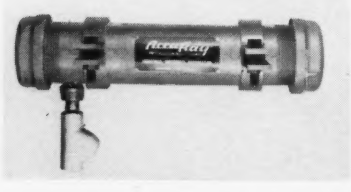


This portable control station, developed by **General Motors Diesel Ltd.** permits the operation of diesel-electric locomotives from any position in the cab. Measuring 5 x 8 x 9 in and weighing 14 lb, the portable control box is equipped with a combination throttle and reverser handle, a brake lever, an emergency stop bush-button and a combination "deadman" control-carrying handle. (226)

Level detector-controller

Industrial Nucleonics Corp. announces the release of another new product for the process industries. This is their AccuRay tank level detector-controller. Technological advances have resulted in lowering the cost of this instrument to make it competitive in price with conventional float-level controllers.

A major advantage of the detector-controller is that no part of the instrument extends into the tank or vessel. Its installation is completely outside the tank. Thus it is completely free from fouling by process material and is easily



maintained. In addition, the instrument can be fail-safe for either the high-level or low-level signal. (227)

Continued on page 82

TOOL STEEL TIPS

Technically speaking, Atlas M4 is a high carbon, high vanadium, molybdenum, tungsten, high speed steel.

Practically speaking, Atlas M4 gives improved abrasion resistance over standard high speed steels with a minimum loss of toughness. It ensures improved life and performance of production tools such as drills, reamers, broaches and form cutters. M4 also gives excellent service on those cold work punches and tools where high wear resistance is a particular necessity.

Type of Tool	Size of Tool	Steel being Worked	Performance Rating		
			T1	M2	M4
Machine reamer	.3482" dia. x 5"	SAE 1035 steel	pcs. 500	pcs. 750	pcs. 2500
Machine reamer	.4375 dia. x 7⅛	SAE 1046 steel	pcs. 500	pcs. 750	pcs. 2500
Combination centre drills and facing tools		SAE 1035 & 1141 steels	50	65	300
Tapered reamers	9/16" dia. on small end	SAE 1035 & 1141 steel forgings	—	50	300
Form tools — Interrupt cutting	Medium	SAE 1045 steel	30	32	56

ATLAS TOOL STEELS

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ATLAS STEELS LIMITED
Welland, Ontario.
Warehouses: Montreal, Toronto, Hamilton, Windsor, Winnipeg, Vancouver.
Representatives: London, St. Catharines, Sudbury.

TS-2-58

UP TO 6 TIMES LONGER TOOL LIFE WITH ATLAS M4

ATLAS TOOL STEELS

Motor insulation: a new effective method is cheaper

Spaulding 33, a new moisture resistant motor insulation has been announced by Spaulding Fibre of Canada Ltd.

It is intended to replace more expensive polyester-film type materials in fan motors, splash-proof motors, air conditioner motors and other motors where moisture-resistant insulation is required. It also replaces acetate-coated fish paper or rag paper-polyester combined materials. The moisture equilibrium of the new material is lower than that of 100% rag paper and its moisture absorption is very much lower after 4 hr total immersion in water. Dielectric strength after 4 hr total immersion is 110 volts per mil.

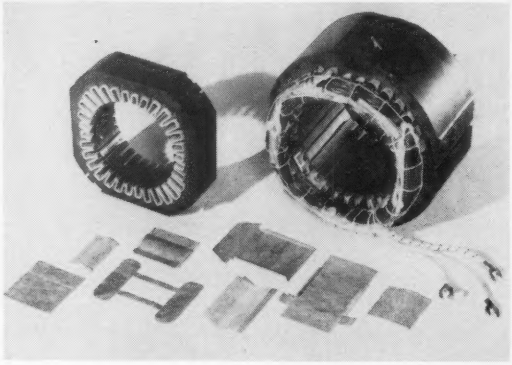
The insulation has the same rag base as standard Spauldo 100% rag paper, but the material has been chemically treated to make is resistant to moisture. The treatment is most effective when applied uniformly throughout the insulation material, so that there are no untreated portions at cut edges.

The material retains the physical properties of rag paper for automatic assembly and processing of motors. Plain and cuffed slot cells, phase insulators and lead weld insultors are easily fabricated from it.

Thermal evaluation tests using procedures developed by AIEE indicate that Spaulding 33 will operate in continuous service at 105 C for 45,000 hr before losing half its physical strength. This is 125% longer than the service life of ordinary rag paper.

Spaulding 33 has performed satisfactorily in motors tested according to the MIL-D-24 humidity test and water spray tests for motor-operated fans.

The material is available in rolls, sheets, strips, coils, cuffed coils and fabricated parts in thicknesses from .007 to .031 in. (223)



IT'S NEW!

Here's a new type of Kuhlmann drafting table that is fully counter-balanced and has the same easy operation as the regular Kuhlmann table — but with these . . .

ADDED FEATURES . . .

- **new functional design**
- **less space requirement**
- **sets up with any type of reference table**

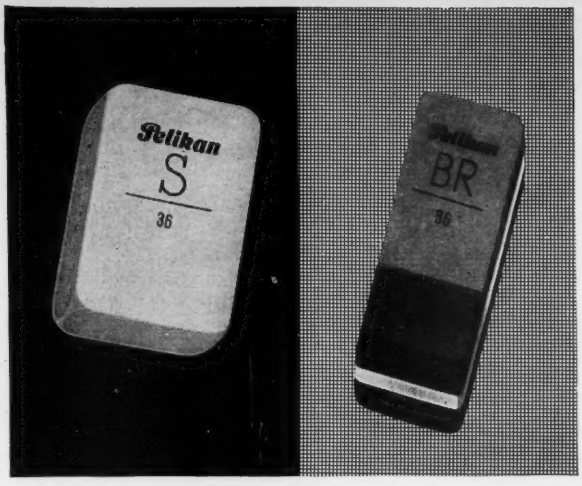
Also, the reliable Kuhlmann Precision Drafting Machine with .005″ guaranteed accuracy.

Write for details to:

Kuhlmann Straube Company Limited

P.O. Box 358 Oakville, Ont.

TEL.: Victor 4-9882



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To convince yourself of the superior quality, please state the type of eraser you require and contact for free sample our exclusive Canadian Distributor

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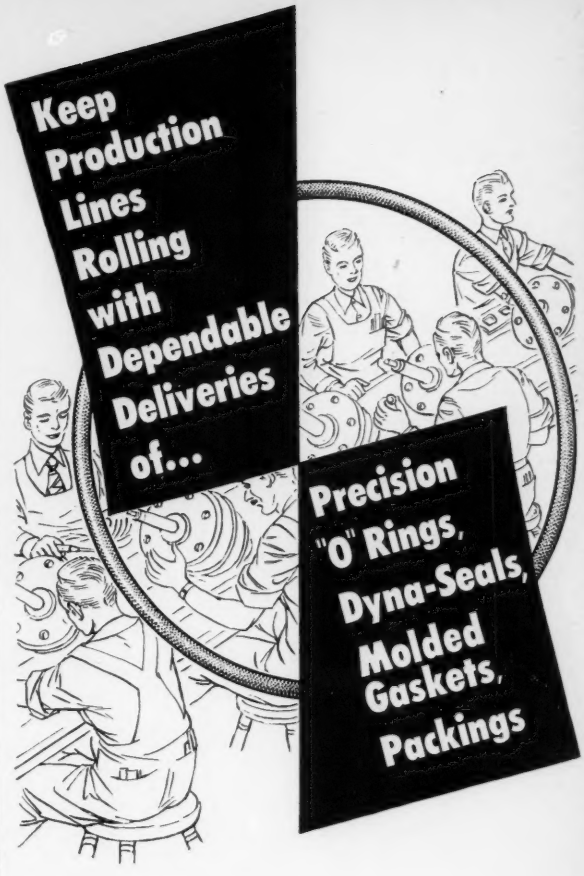


HIGHEST QUALITY SEALS

Providing positive dependable leak-proof service.

Countless sealing problems have been solved with "Precision" products. They are manufactured from quality materials to closest tolerances and provide the best possible seal for the service specified.

The widest range of types and sizes is available for your convenience. Write for copy of handbook of Precision packings.

Precision "O" Rings High quality, compression molded—they assure trouble-free, leak-free sealing with gases, oils, gasoline, water, cooling fluids, refrigerants and many other special liquids.

Precision Dyna-Seals —for sealing under bolt heads, rivets, flanges, circular flat surfaces—no groove necessary.

Precision Rubber Products
(CANADA) LTD.
"O" Ring and Dyna-seal Specialists
Ste. Thérèse de Blainville, Québec

Why Use Less Than Chemlon* Packings In Your Hydraulic Cylinders

Hydraulic equipment manufacturers are now taking a *second* look at the many advantages of "John Crane" CHEMLON hydraulic packings and offering them in place of leather, fabric-reinforced and similar packings.

THE REASON . . . CHEMLON provides several very important service advantages.

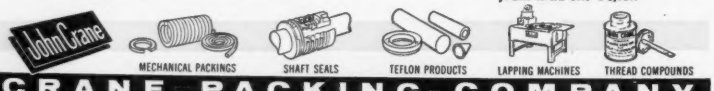
1. Increased cylinder life due to the inherent non-frictional qualities of CHEMLON.
2. Longer packing service life—CHEMLON outlasts all other types of packing to a remarkable degree . . . decidedly cuts replacement, down time and maintenance.
3. Universal application—CHEMLON'S inertness to all types of hydraulic fluids, including non-flammables and synthetics . . . eliminates the need for customers stocking a wide range of special packings.
4. Trouble-free performance—CHEMLON withstands temperature conditions encountered in hydraulic service up to 350°F.

"John Crane" CHEMLON–*The Best in Teflon*–offers a complete line of piston cup, "U" cup and flange packing for every service requirement.

Get the new bulletin No. P-322 on "John Crane" Hydraulic Packings.

CRANE PACKING CO., LTD.
631 Parkdale Ave. N., Hamilton, Ont.

*"John Crane" fabricated from DuPont Teflon



CRANE PACKING COMPANY

Power manipulators

(Continued from page 57)

The complete operation of the manipulator is controlled by a single operator from a small console, conveniently located according to the viewing arrangements.

All the movements of the manipulator are controlled by means of two joysticks. The joystick handles have simultaneous freedom of motion in three directions: perpendicular to the mounting face, up and down, and from side to side. A fourth motion is obtained by turning the handle through an angle of 60 deg about its own axis. Each of these motions is associated with a corresponding movement of one of the manipulator components (as shown in Table 1) the degree of displacement of the joystick being proportional to the speed of the corresponding manipulator movement. The motions of the joystick are arranged to follow logically those of the manipulator. This feature enables a relatively unskilled operator to control the machine with ease.

The joysticks are fitted with centre-return springs, and each handle incorporates a "dead man" grip. Once the handle is released, there can be no movement of the manipulator.

The control for the hand or hook has been designed to permit adjustment both of the closing speed and the grip force. These two features are incorporated in one joystick motion, so that low grip force is associated with low speed. A high speed of closing onto a delicate object is not a natural requirement. Once the jaws are closed, the grip force can be increased, simply by displacing the joystick further from the central position.

The outward thrust or grip force between the hand jaws is indicated on an instrument mounted on top of the console. This instrument is non-linearly scaled 0 to 150 lb so that the 15-lb graduation is in the mid-scale position. This ensures adequate sensitivity of indication when handling light or fragile objects. A further indication of grip force is provided by an audible signal from a variable-frequency oscillator, so that the operator can concentrate on watching the manipulator.

Switches for controlling the hoist block and for locking any of the manipulator motions in a given position are provided on top of the console.

The basic elements of the manipulator can be assembled in a variety of ways to fit different sizes of cell, and for other forms of mounting than from a crab moving in a horizontal plane. This adaptability, and its general flexibility of movement, make the machine suitable for a wide range of operations. ★

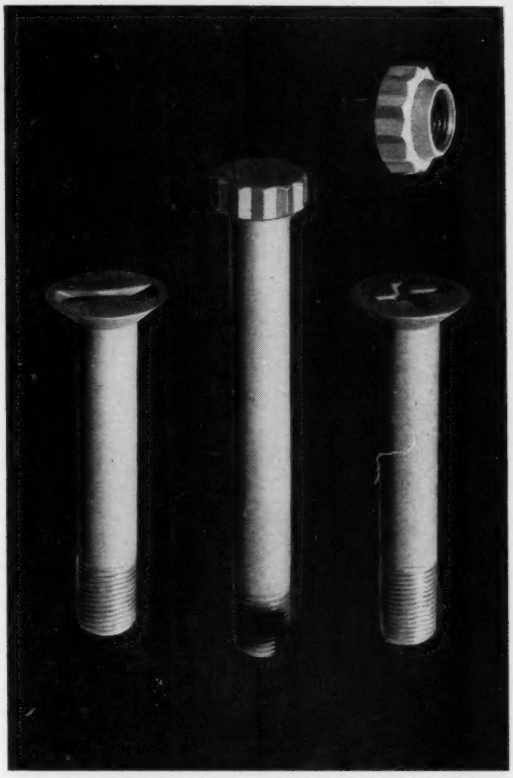
Design Engineering DATA SHEET

Shear bolts • • •

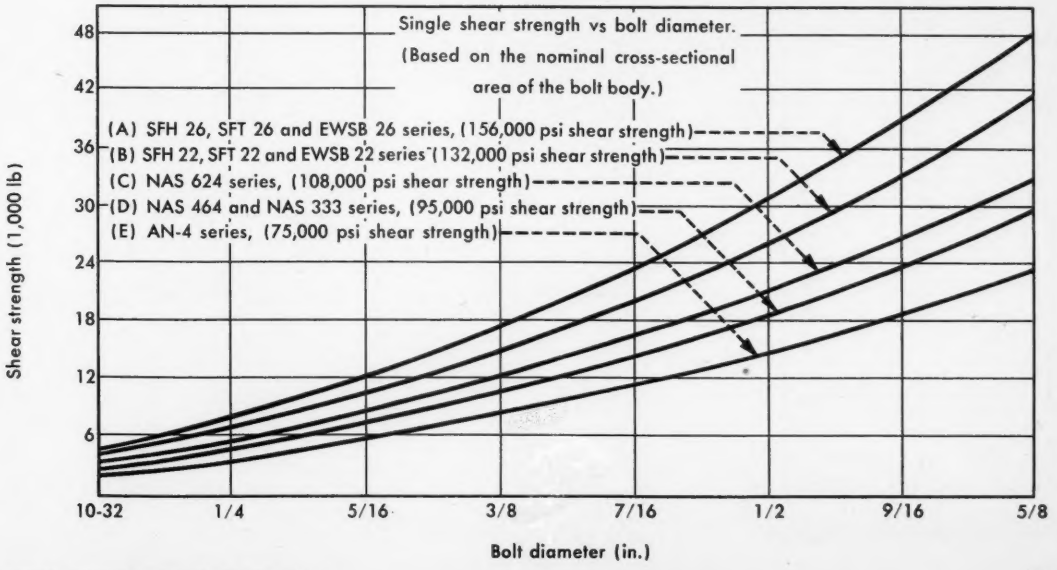
In all, twelve new shear joint families to cut plane, missile weight

The chart shows the shear strength plotted against bolt diameter for different shear bolts. It emphasizes the great weight-saving potential of the new high-strength aircraft shear bolts introduced by Standard Pressed Steel Co. In some cases, one of the new shear bolts can do the job of a conventional fastener two full sizes larger. The two top curves show the new SPS shear joints, available in the two stress levels noted. The remaining curves (C, D and E) represent current aircraft standards.

A design load of 30,000 lb, for example, would call for a ⅝ in. diameter NAS bolt (Curve C), but a ½ in. bolt in the 156,000 psi series (Curve A) would do the job. Though by configuration not tension bolts, these SPS shear bolts have an ultimate tensile strength of 260,000 psi and are thus claimed to be the strongest threaded fasteners yet offered to industry.



Three high-strength shear bolts and a 12-point locknut.



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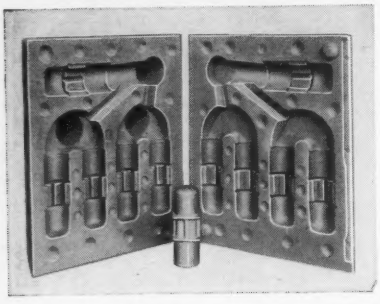

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Tallman shell moulding techniques make better castings in non-ferrous metals — faster and at lower cost.

Accurate moulds of fine sand and thermosetting resin produce smooth, well finished castings to extremely close tolerances.

These quality castings

- minimize and often eliminate expensive machining operations.
- reduce weight of castings in most cases.
- effect savings in time and money.

Call or write today . . . find out how Tallman techniques can better fill your casting requirements.

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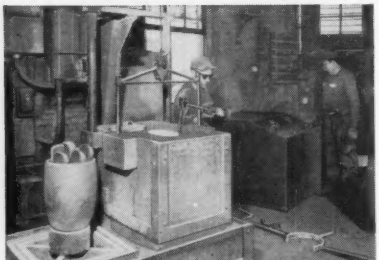

Tallman's High Frequency Induction Melting Furnace attains the ultimate in melting efficiency for both bronze and aluminum.

Temperatures over a wide range can be controlled to the specified degree for any required duration — a necessity when manufacturing castings of special alloys to perform under difficult conditions.

Let our experienced, highly skilled personnel assist you on your casting requirements.

Write today for further information on how our modern techniques and facilities produce better castings at economical prices.

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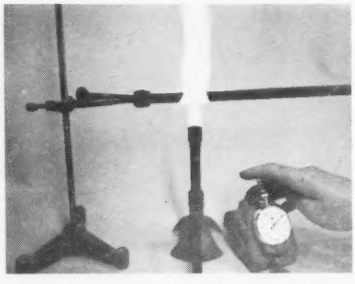
New products
Continued

Flame-retardant insulation

A new flame retardant electrical insulation laminate claiming savings of up to 50% over other available flame-retardant electrical grade laminates is announced by **The Glastic Corp.**

This new self-extinguishing material is designed for continuous operation at full Class B temperatures.

Glastic grade UTS is recognized by Underwriters' Laboratories "for sole support of current carrying members to temperatures of 150 deg C." It is applicable for insulating parts in equipment such as motors and appliances and as barriers and insulating supports in heavy

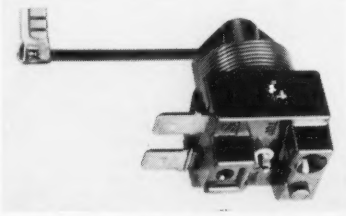


electrical equipment such as switchgear, power and distribution apparatus. (228)

Starting relays

Design simplification of current-type motor starting relays allows the production of a lower-cost series by the **Metals & Controls Corp.** This Klixon 9660 series is available in narrow differentials with stable pick-up and drop-out ratings from 1.01 amp max pick-up (switch close)—0.86 amp min drop-out (switch open) to 24.4 amp max pick-up —20.3 amp min drop-out. These relays are used on single phase ac hermetic refrigeration motors and in place of centrifugal starting switches on other single phase ac motors of the split phase or capacitor start type.

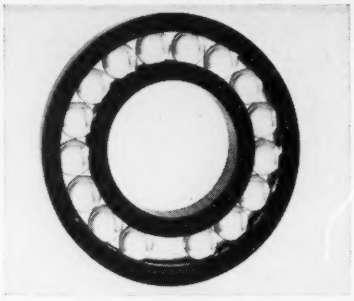
The units are small in size and have easy one screw mounting. They are fully enclosed in phenolic cases for protection against dust and dirt. The welded coil



connections and long-lasting contacts are engineered for 1,000,000 operations. Contact ratings are 10 amps and over depending upon cycle requirements. (229)

Phenolic bearing

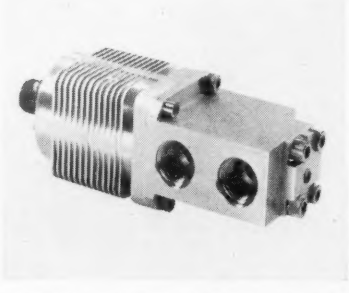
This bearing is manufactured from a linen base phenolic, uses pyrex balls for a nonmagnetic bearing application. Ac-



cording to the type of phenolic used, it can be run immersed in water, acids, oils, and unusual environments that steel balls will not allow. It is manufactured by **Halax Corp.** (230)

Missile and rocket valves

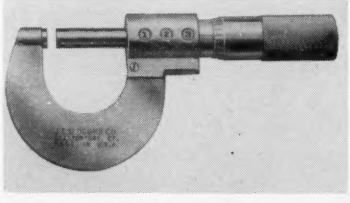
Skyvalve, Inc. supplies valves as standard models (in either stainless steel or aluminum) which are capable of controlling such fluids as hydrogen peroxide, nitric acid, normal propylinitrate, helium, nitrogen, and liquid oxygen. Currently under production are some 48 different solenoid valves either normally closed or normally open: 2-way; 3-way; 4-way,



2-position, and 4-way, 3-position. Piloted and direct-acting valves are available from pressure ranges of 0 to 3,000 psi and higher. (231)

Micrometer

J. T. Slocomb Co.'s "speedmike" is a



micrometer which reads from a counter type dial. This alleviates the need to calculate readings, reducing the chance for error. (232)

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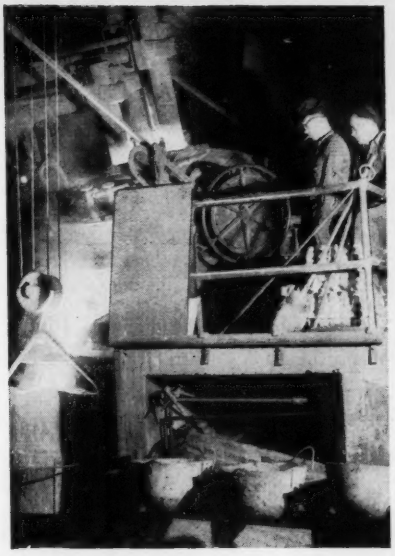

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when anchored in place with "RAWLBOLTS",* the expansion shields which have held up a mountain-side in Italy, held down street-car tracks in Britain, kept railway turntables in place in India and helped in the construction of the St. Lawrence Seaway.

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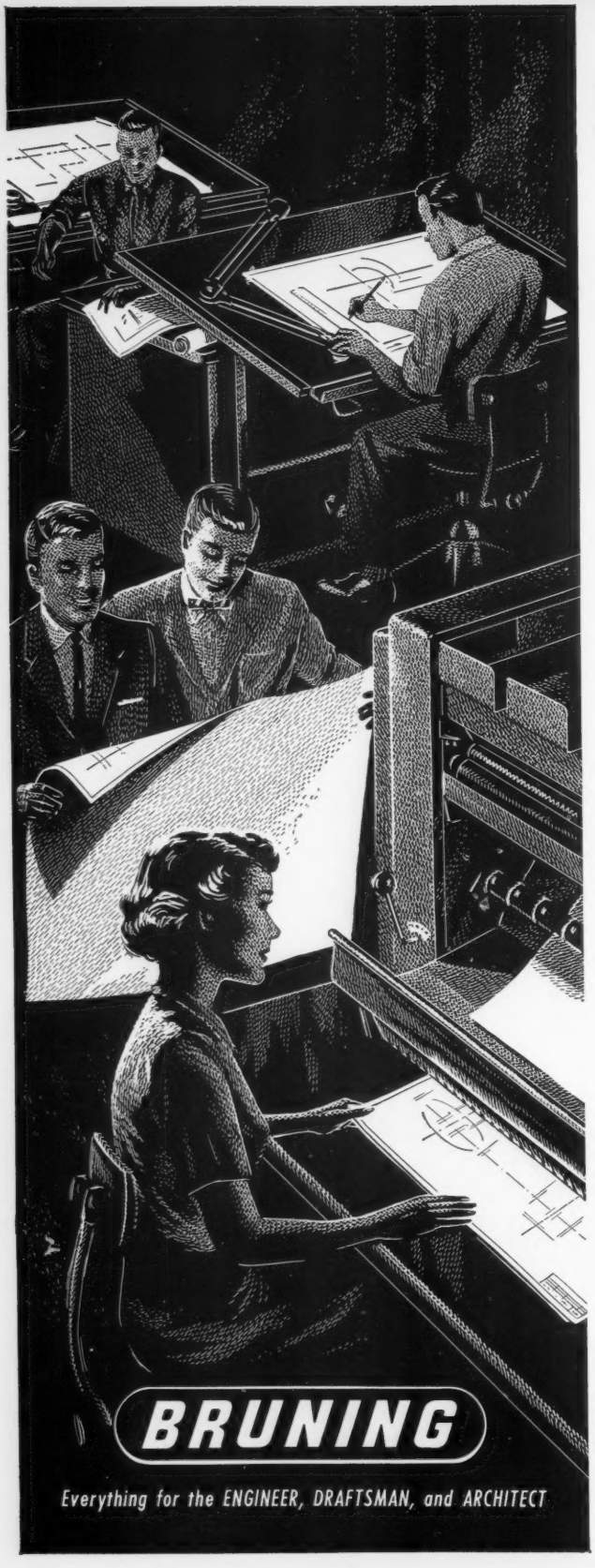

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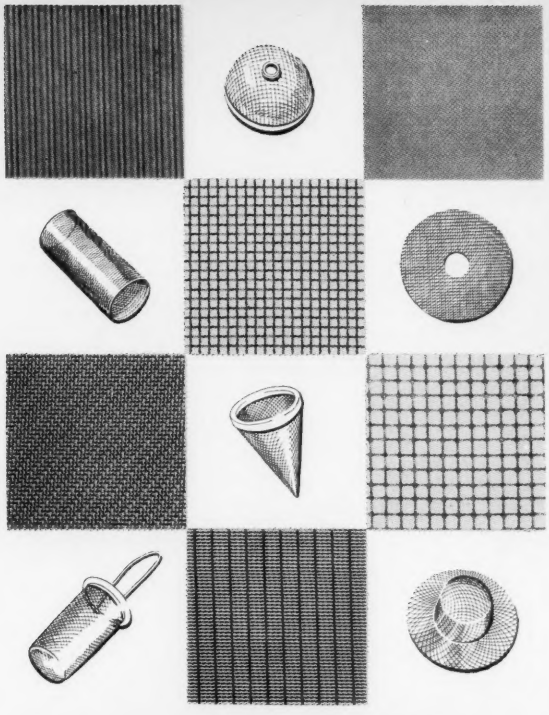

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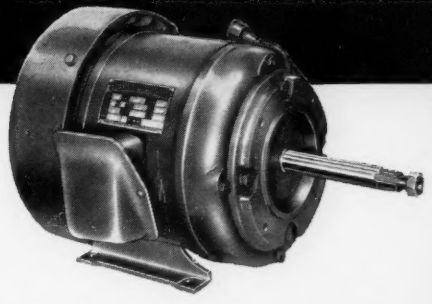

This R&M pump motor is ideally suited to centrifugal pumps with either open or closed face impellers. The impeller is mounted directly onto our motor shaft, thus eliminating the more costly method of using flexible couplings and heavy base plates. You get longer life and better performance from your pumps with these drip-proof or totally enclosed fan-cooled R&M motors.

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These motors are available in ratings from ¼ to 50 horsepower; CEMA rerate motors to frame 365U equipped with CEMA rerate standard flanges; heavy duty motor bearings with extra thrust capacity; locked bearing construction to eliminate end play; accurate CEMA machine tolerances on flange and shaft. The single motor pump shaft assures perfect alignment of all rotating parts.

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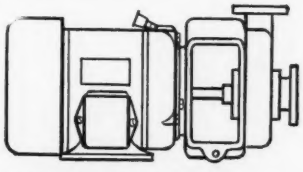
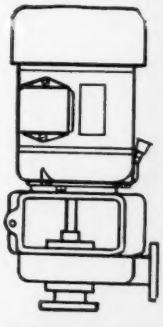
- Available in stainless steel for food pump as an extra





HORIZONTAL OR VERTICAL

These R&M motors may be used on centrifugal pumps either vertically or horizontally or in any angular position. Where the pump is mounted vertically, it is advisable that the motor be placed above the pump.

In addition to the above features, you get ***guaranteed*** motor performance. Moreover, the R&M motor is attractively priced. It is a Canadian motor built by Canadian workers. For further information, ask for Bulletin 2003/5811.

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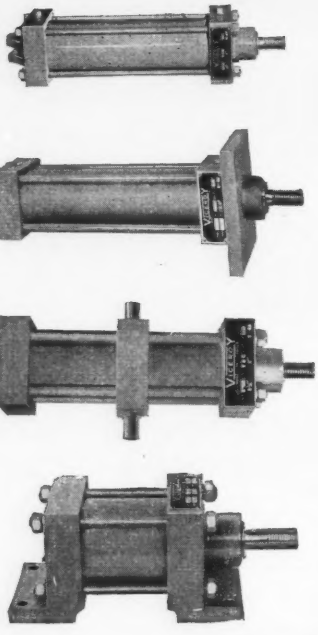

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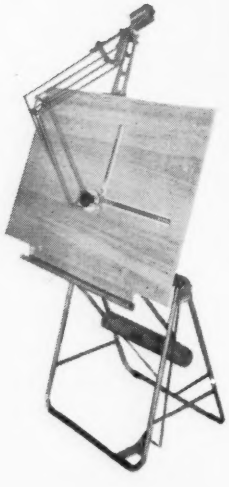

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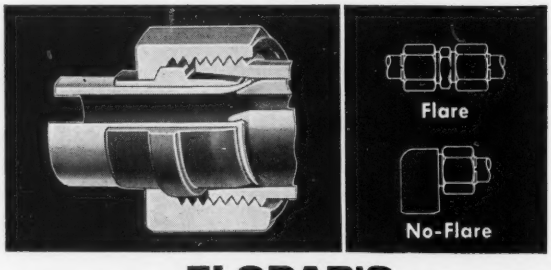

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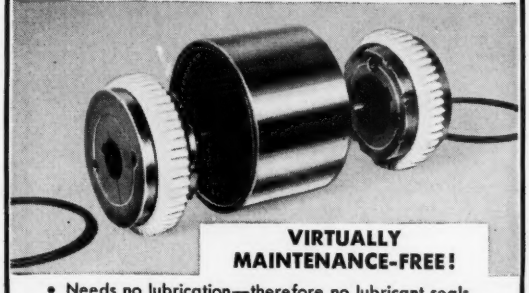

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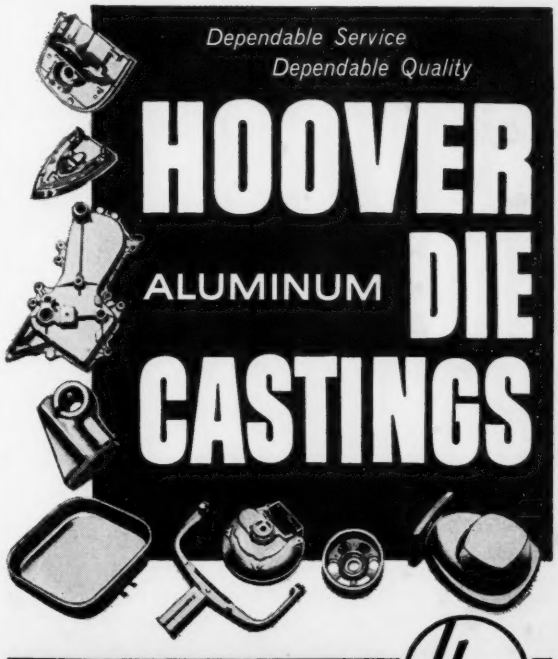

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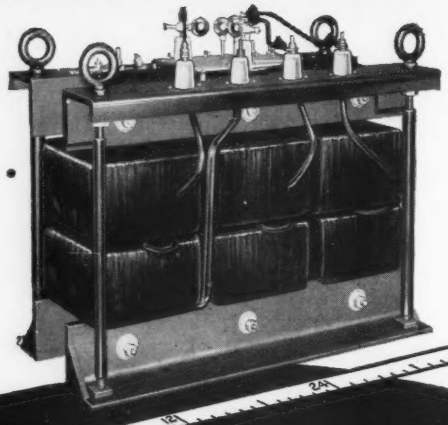

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The miniature transformer, for transistor and vacuum tube circuitry, dealing with energy levels of one-thousandth of a watt; and the 1100 pound, 3 phase, plate transformer are extreme opposites in the Hammond Transformer line.

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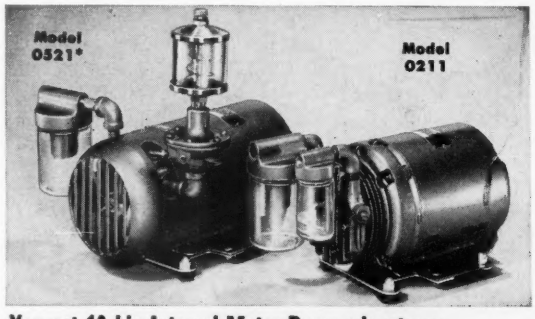

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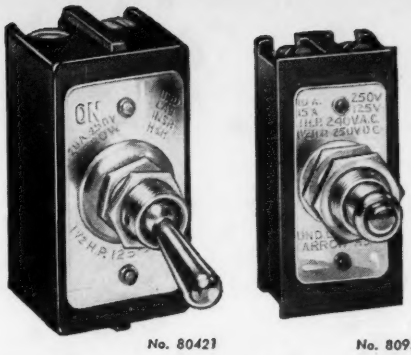

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Editorial

Industrial design makes progress

A conference to study the role of industrial design in relation to engineering is to be held in the U. K. this month by the Council of Industrial Design.

Discussed will be—steps to be taken to improve the form and function of engineering products; how to make the best use of industrial design; how to encourage an appreciation of appearance design; the introduction of training in industrial design to engineering courses and the training of industrial designers for the engineering industries. Good industrial design, it is realized, can be the deciding factor in a sale, when all other factors have been observed.

It is interesting to note that the subject of industrial design is now considered of such importance that the Institution of Mechanical Engineers is including it as an optional feature of their courses for mechanical engineers.

Basic research

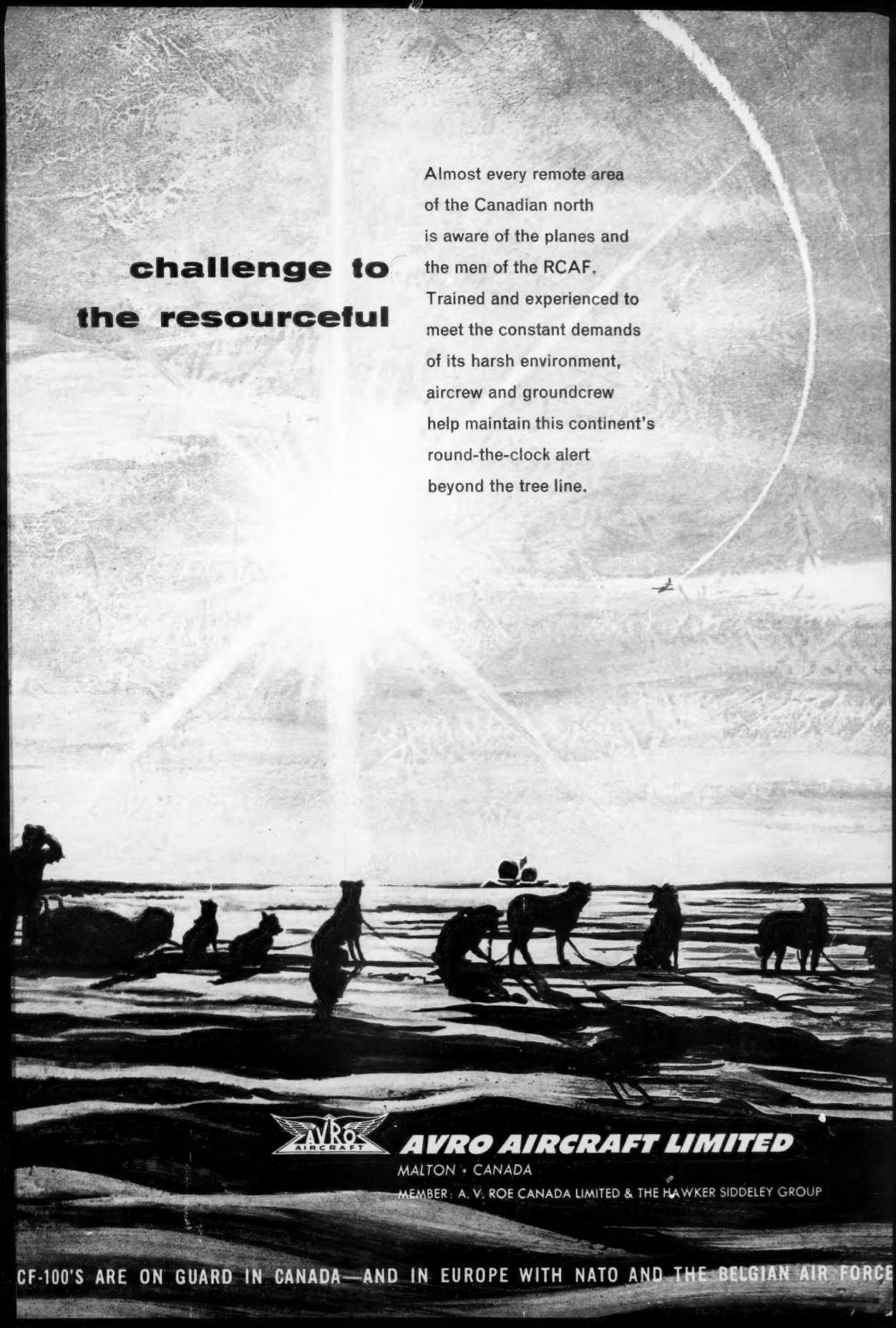
In his luncheon address at the Province of Ontario's Industrial Development Conference last month, W. R. McLachlan, executive vp of A. V. Roe Canada Ltd., quoted some provoking figures on basic research, an area in which he considers Canada (and Canadian industry in particular) sadly lacking.

A Dominion Bureau of Statistics survey in 1955 showed that, from 2,500 Canadian firms (large and small), only 377 were doing any research at all, for a total of $66 million as against about $7 billion in the U. S.

Today with a population one tenth that of the U. S., but an expenditure one hundredth ($100 million against $10 billion), the per capita expenditure on research and development in Canada is still but one tenth that of the U. S.

The suggestion was not that we try to outdo the U. S., or that we design and produce in Canada everything we need, but rather that we could in many cases design a better product for Canadian purposes at a price competitive with any in the world.

William Morse.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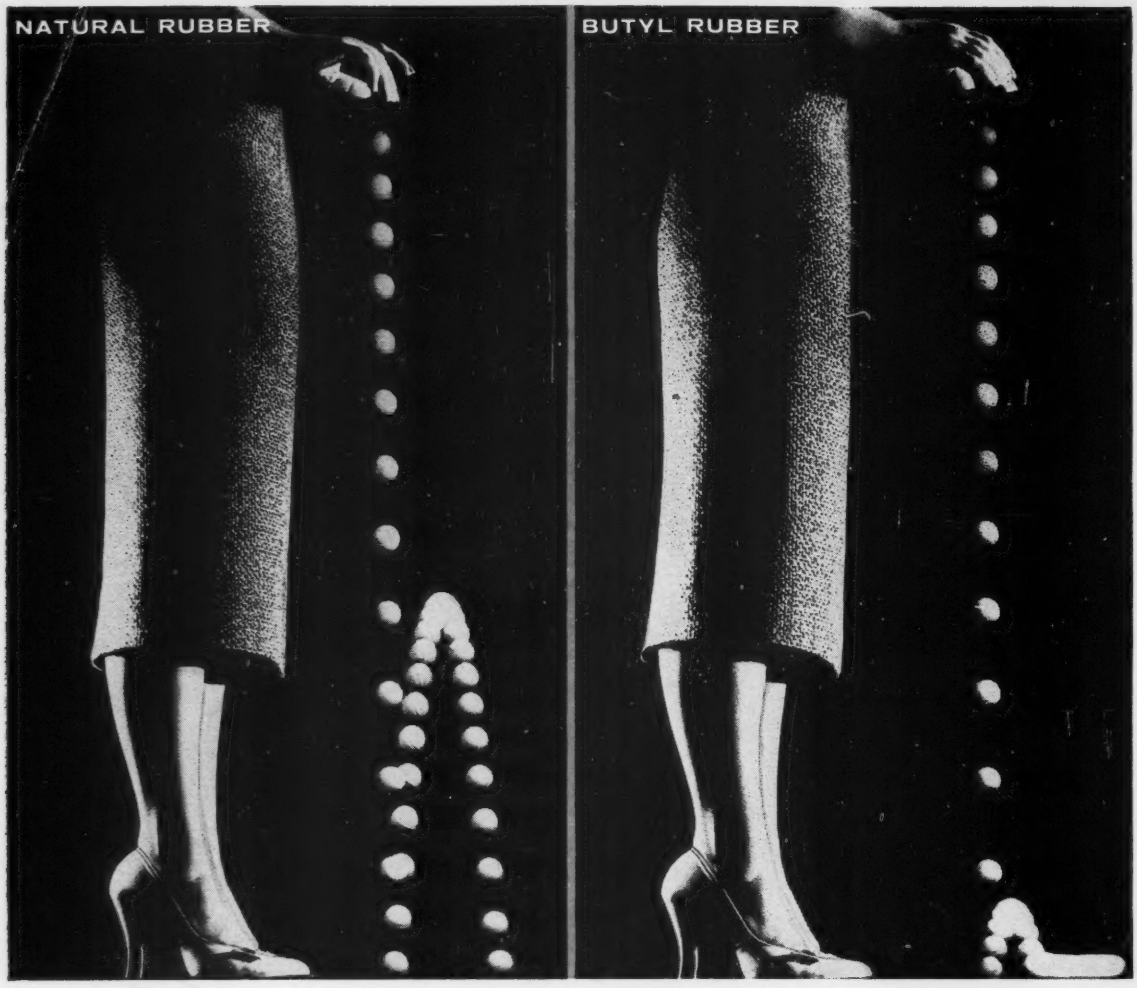
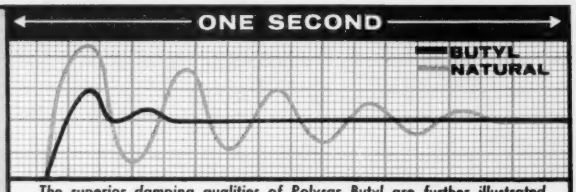


Here is visual proof of the higher damping qualities of Polysar Butyl. Both balls in these two stroboscopic photographs were dropped from waist height. The ball on the left absorbed only a fraction of the shock energy and consequently rebounded sharply. The Polysar Butyl ball on the right absorbed almost all the shock energy. Even the most resilient Polysar Butyl compounds show markedly less rebound, and consequently higher energy absorption than any other kind of rubber.

Look at *Polysar Butyl's damping qualities



The superior damping qualities of Polysar Butyl are further illustrated in this graph which compares the amount of energy absorbed by Butyl and natural rubber.

Do you have an application involving damping mechanical and/or sonic vibration? Then, consider *Polysar Butyl.

Regardless of the degree of softness, Polysar Butyl compounds invariably have higher damping and shock absorbing properties than any other kind of rubber. With Polysar Butyl you can mould any desired shape to fit individual product designs. Shock absorbing parts made from Polysar Butyl absorb energy and swiftly damp out both sonic and mechanical vibrations.

For applications ranging from automobile shock absorbers to mountings for delicate instruments Polysar Butyl offers significant advantages worthy of study. Write our Sales and Technical Service Division for technical information on Polysar Butyl rubbers.

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